modern castings

Owned by the men who Buy

MAY 1956

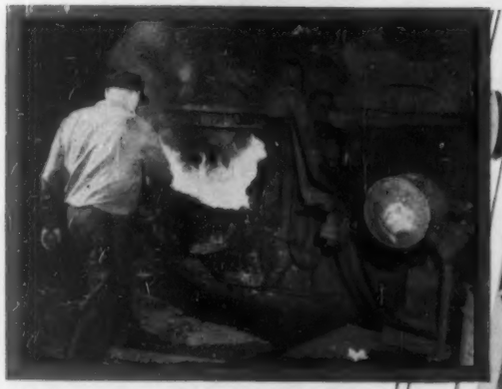
BUYERS' DIRECTORY ISSUE

AFS CASTINGS CONGRESS

SPECIAL REPORT

"The Foundry of Tomorrow"

EXHIBIT GUIDE and DIRECTORY



One of two Lectromelt Furnaces at Valley Steel Casting Company

38,715 pounds of steel were poured to produce this automotive die block at Valley Steel Casting Company, Bay City, Michigan.

Cast 16-ton die block with two Lectromelt* Furnaces of 9-ton combined capacity

One heat was poured from each furnace, with a touch up heat for the risers.

Careful planning by Mr. Samuel S. Fair, Plant Manager, and Mr. George W. Barker, Chief Melter, preceded the casting of this block, said to be the largest commercial electric steel casting ever produced in Michigan. Every facility of the melting department had to be coordinated so that both furnaces could be tapped simultaneously and one quickly recharged, so that a "touch up" heat could be melted for the risers.

The Lectromelt Furnaces gave their usual excellent performance—quick turnaround, with top quality steel.

Lectromelt Furnaces are built sturdily to take such pushing for production; you see the results with lower upkeep costs. And while you're crowding on the power, Lectromelt's pinpoint control lets you hold analyses to exacting specifications.

Catalog 9-A describes these furnaces. For a copy, write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in...GERMANY: Friedrich Kocks GMBH, Dusseldorf...ENGLAND: Birlec, Ltd., Birmingham ...FRANCE: Stein et Roubaix, Paris...BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege...SPAIN: General Electrica Espanola, Bilbao...ITALY: Forni Stein, Genoa...JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF

MOORE RAPID

WHEN YOU MELT... Lectromelt

CIRCLE NO. 177, PAGE 13-14

future meetings and exhibits

MAY

3 . . Non-Ferrous Founders' Society, *Atlantic City, N. J. Annual Membership Meeting.*

3-9 . . American Foundrymen's Society, *Convention Hall, Atlantic City, N. J. 60th Annual Castings Congress and Show.*

4 . . American Association of Spectrographers, *Chicago. 7th Annual Conference.*

7-8 . . Second Annual Metals Institute, *Oklahoma A & M College, Stillwater.*

8-11 . . American Welding Society, *Buffalo, N. Y. Spring Meeting & Fourth Welding and Allied Industry Exposition.*

10-11 . . Refractories Institute, *Grand Hotel, Point Clear, Ala. Annual Meeting.*

11 . . Malleable Founders' Society, *Hotel Commodore, New York. Eastern Section Meeting.*

20-23 . . Industrial Heating Equipment Association, *The Homestead, Hot Springs, Va. Spring Meeting.*

21-24 . . Air Pollution Control Association, *Buffalo, N. Y. 1956 Niagara Frontier Annual Meeting.*

31-June 1 . . Magnesium Association, *The Broadmoor, Colorado Springs, Colo. Annual Business Meeting.*

JUNE

4-8 . . American Foundrymen's Society, *LaSalle Hotel, Chicago. Technical Committee Week.*

5-8 . . Materials Handling Institute. *Public Auditorium, Cleveland. Materials Handling Exposition.*

6 . . American Foundrymen's Society, *LaSalle Hotel, Chicago. Technical Council.*

11-12 . . Malleable Founders' Society, *The Homestead, Hot Springs, Va. General Society Meeting.*

14-16 . . American Foundrymen's Society, *Kellogg Center, Michigan State University, East Lansing, Mich. Education Seminar.*

17-22 . . American Society for Testing Materials, *Chalfonte-Haddon Hall, Atlantic City, N. J. 59th Annual Meeting.*

18-29 . . Metallurgy of Iron & Steel-

making, *Massachusetts Institute of Technology, Cambridge. Special Summer Program.*

24-26 . . Alloy Casting Institute, *The Homestead, Hot Springs, Va. Annual Meeting.*

28-29 . . American Foundrymen's Society, *LaSalle Hotel, Chicago. 13th Annual Chapter Officers' Conference.*

SEPTEMBER

1-9 . . International Foundry Trades Fair and 23rd International Foundry Congress, *Dusseldorf, Germany. Hosts: Association of German Foundrymen, Industrial Association of the Foundry Industry, Foundry Machinery Trade Association, and Joint Association of German Metal Foundries.*

11-13 . . American Die Casting Institute, *Edgewater Beach Hotel, Chicago. Annual Meeting.*

17-21 . . Instrument Society of America, *New York Coliseum, New York. 11th Annual Instrument-Automation Conference & Exhibit.*

24-25 . . Steel Founders' Society of America, *The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.*

24-26 . . Material Handling Institute. *The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.*

25-28 . . Association of Iron and Steel Engineers, *Public Auditorium, Cleveland. Iron and Steel Exposition.*

OCTOBER

4-5 . . Magnesium Association, *Drake Hotel, Chicago. Annual Convention.*

11-12 . . National Foundry Association, *Detroit. Annual Meeting.*

11-12 . . Armour Research Foundation, Illinois Institute of Technology, *Hotel Sherman, Chicago. National Noise Abatement Symposium.*

18-20 . . Foundry Equipment Manufacturers' Association, *The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.*

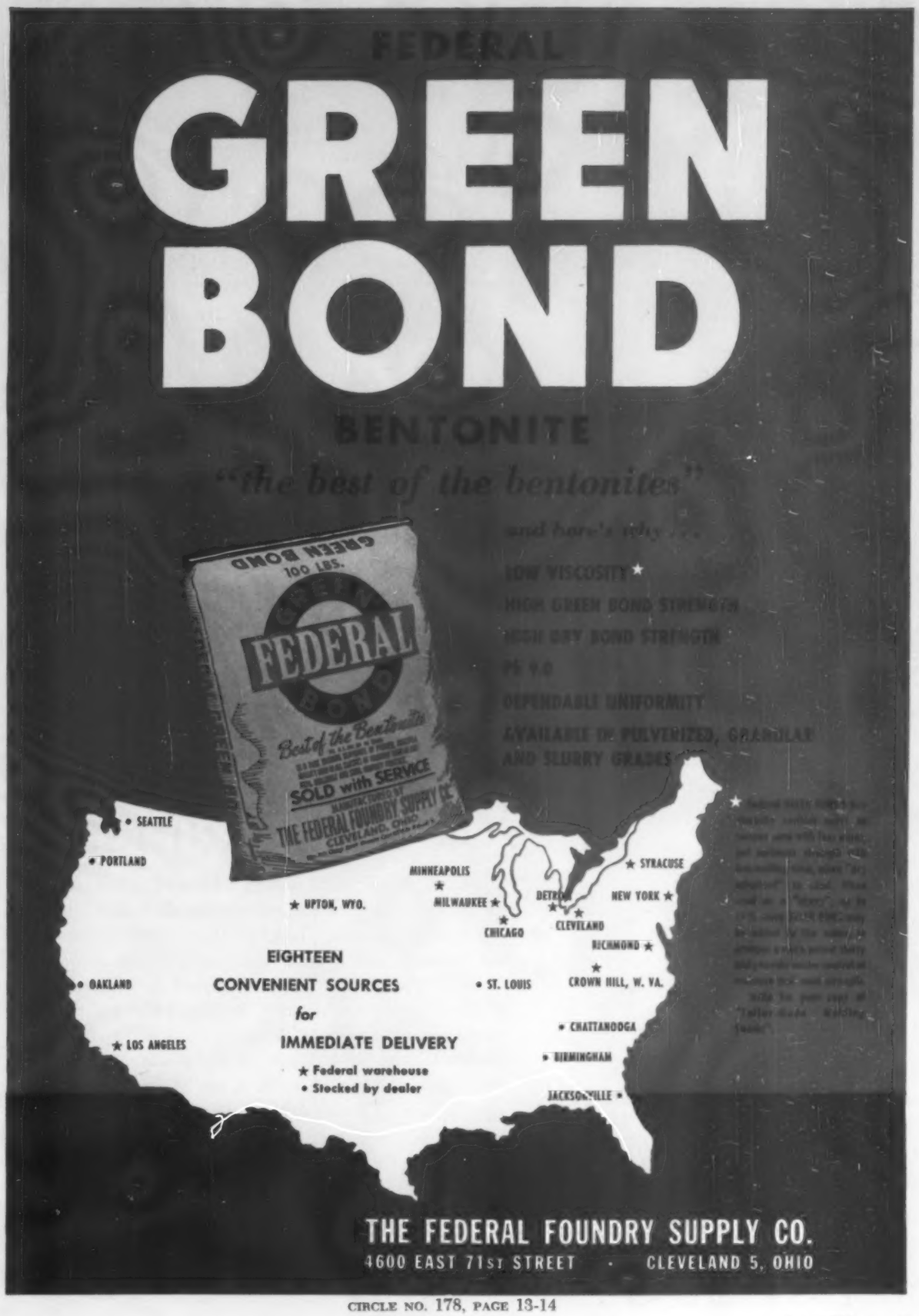
29-30 . . Refractories Institute, *The Homestead, Hot Springs, Va. Fall Meeting.*

30-Nov. 2 . . Gray Iron Founders' Society, *The Homestead, Hot Springs, Va. Annual Meeting.*

NOVEMBER

7-9 . . Steel Founders' Society of America, *Carter Hotel, Cleveland. Technical & Operating Conference.*

8-9 . . All-Canadian Foundry Confer-



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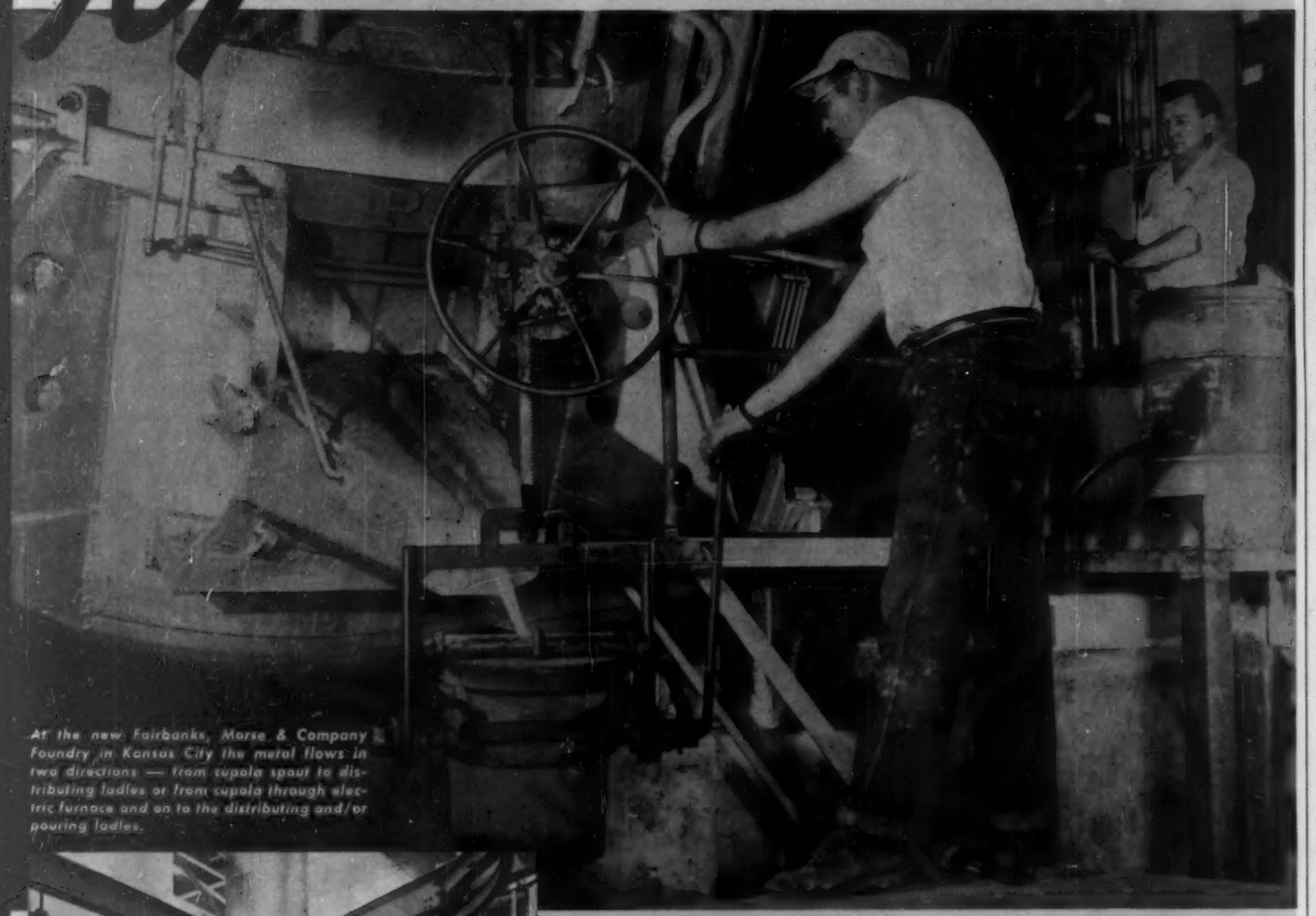
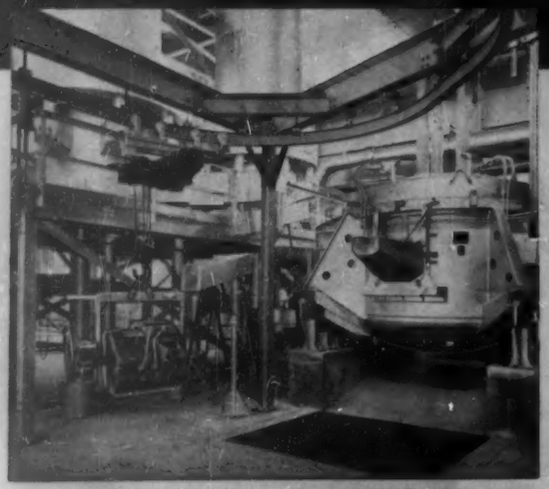
Modernized...



At the new Fairbanks, Morse & Company Foundry in Kansas City the metal flows in two directions — from cupola spout to distributing ladles or from cupola through electric furnace and on to the distributing and/or pouring ladles.



FOR TOP EARNINGS!

POURING AND DISTRIBUTING SYSTEMS are just as productive as the engineering that goes into their over-all planning: Large castings, small castings, high tonnages, low tonnages, ferrous and non-ferrous all make a difference. "Showing-how" to cope with all these varying conditions is the extra value you gain when you plan with MODERN. Catching from the electric furnace, after duplexing, and moving the metal direct over monorail to mold is one of those different applications. Check-marking the catalogs you may require is a fast, easy way to learn more about your charging, melting and pouring problems . . .

FEMA MODERN

MODERN EQUIPMENT COMPANY
Dept. M-5, Port Washington, Wisconsin

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MODERN REPRESENTATIVES IN ALL PARTS OF THE WORLD

ence, *Mount Royal Hotel, Montreal, Que. Sponsored by Eastern Canada and Ontario Chapters of the American Foundrymen's Society.*

29-30 . . Michigan Regional Foundry Conference, *University of Michigan, Union Bldg., Ann Arbor, Mich. Sponsored by the Detroit, Saginaw Valley, Central Michigan, and Western Michigan Chapters and the University of Michigan and Michigan State University Student Chapters of the American Foundrymen's Society.*

Manganese Link

Now, I'm a coremaker, and I'm not a faker;
I'm good, and I'm quick as a wink.
I can make any core for the doghouse or floor,
But I can't make a manganese link.

Now whether you're down in the coreroom,
Or up in the doghouse, I think
You're bound to have double your usual trouble
Making that manganese link.

I've got rheumatism and chilblains
In my back there's a knot and a kink.
I've got corns on my toes and a scab on my nose
From making that manganese link.

You can bawl me out, fire me, sock me.
You can have me tossed into the clink
But, Boss, for gosh sake, don't tell me to make
That dad-ratted manganese link.

I'll bring you a ham or a chicken,
I'll take you and buy you a drink,
If tomorrow you'll see the assignment for me
Won't be that old manganese link.

Oh, give it to Ed, or to Johnnie or Fred,
Or to Dick or to Carl or Ike,
Or give it to Jack or to Don or to Mac,
Or to Merv or to George or to Mike.

Just give me a crack at that old bucket back
And I don't give a damn what they think.
Give me any old core for the doghouse or floor.
DON'T GIVE ME THAT MANGANESE LINK!

From *Rammed Up and Poured*, book of foundry poems by Bill Walkius, former sand mill operator, editor of *The ESCO Ladle* of Electric Foundry Co., Portland, Ore.

may, 1956
vol. 29, no. 5

modern castings

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AUDITED PAID CIRCULATION ABC

TIPS, TRENDS AND TECHNIQUES

■ What will you be doing and what tools will you be using in the Foundry of Tomorrow? For a beautifully illustrated, clear-eyed view of the future as seen by some pretty experienced people, just turn to page 89 and the giant, 24-page Bonus Section.

■ If you still have a question about where to buy some item for your foundry of today, you had better cast an eye over the Directory of Exhibitors and Products on page 77. This list of exhibitors at the 60th AFS Castings Congress & Show can be kept on the desk for use as a buyers guide.

■ What is your Chapter? Bet there is a picture of some of its activities in local foundry news this month. You can find out by turning to page 142 where this popular department starts.

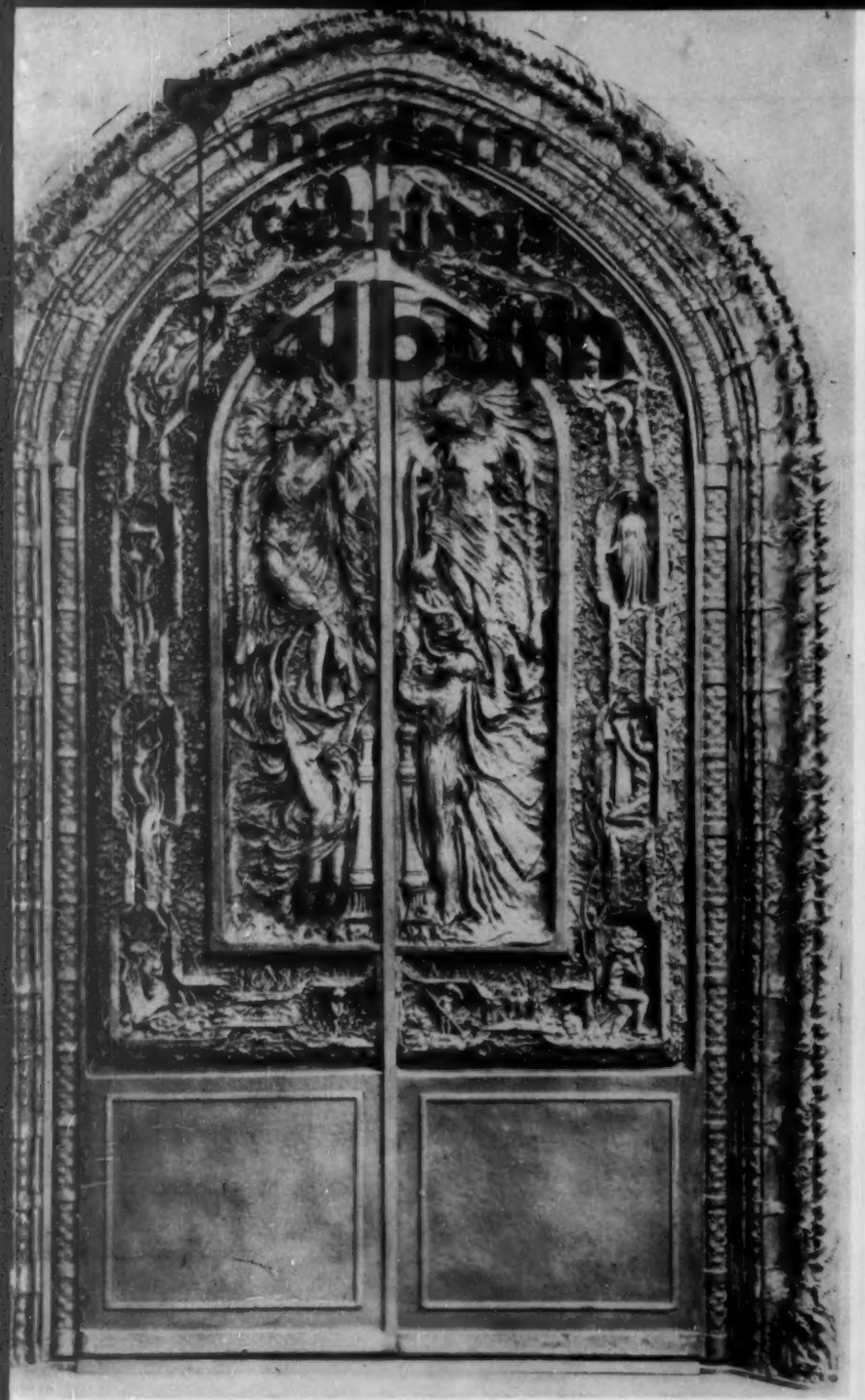
■ Want to sneak a look at some of the Atlantic City exhibits? In products and processes, starting on page 6, you'll find many of the new items that will be the center of attention at Atlantic City.

■ The backbone of this magazine, the technical articles, is stronger than it has ever been. Twelve strong articles that run the gammut from A. C. Sinnett's basic view of a cost program to C. A. Sanders' straight-forward remarks about the problem of snotters in the steel foundry.

■ In this issue you will find a number of small cartoons. Our cartoon program was started several months ago and the editors have attempted to locate artists with personal, inside knowledge of foundry life. How do you think they are doing? Let us know.

■ Coming up . . . Injection process for desulphurizing and upgrading iron . . . Metal flow in runners and gates . . . What you can do about gas and non-metallic inclusions in aluminum . . . Low cost moisture tester for sand control you can make yourself . . . More cupola emission data . . . How to take an accurate inventory . . . Methods engineering for foundry supervisors . . . Most neglected phases of cupola operation.

■ What a Bonus Section in June! A round-up of what's new in foundry equipment and materials as shown for the first time at the AFS Castings Congress & Show in Atlantic City, May 3-9. Novel, worth-while ideas are more numerous this year than at any previous AFS Show and Modern Castings in June will devote its entire Bonus Section to telling you about them.



Fabulous beauty, the creative life of one man and years of perseverant effort by two others are wrapped up in this great bronze Door of Life. The two 9½ ft doors and the massive 10½ ft Gothic frame were produced by the lost wax process in 30 sq in., 200 lb sections by Felix Peano who began his life's work in 1914. After designing all the sections, he turned the task over to Jacob Pfeiffer. After World War II, Robert Haley, Advance Aluminum & Brass Co., lent his assistance and the door was completed in 1954. Now it is on display at Haley's Los Angeles firm.

Artistry of function and another form of creative genius were evident at the Danville, Ill., plant of GM's Central Foundry Division where the new shell molded, pearlitic malleable Pontiac crankshafts were recently introduced to the public. The shell machines, above cycle automatically. Many of the subsequent operations have been automated, largely with equipment that was designed on the job by the plant's own engineering staff. One of the final operations is the inspection of finished castings on a sonic tester that rings the castings and listens to the sound. This equipment will be on exhibit at the AFS Castings Congress and Show in the display at the left. Below, plant manager R. Verne Righter displays castings and a finished crank to S. E. Skinner, right, GM vice-president, while James H. Smith, general manager of the Central Foundry Division, watches.

Who Am I?

- I am more powerful than the combined armies of the world.
- I have destroyed more men than all the wars of the nation.
- I am more deadly than bullets and I have wrecked more homes than the mightiest of guns.
- I steal in the United States alone over $500,000,000 each year.
- I spare no one, and I find my victims among the rich and the poor alike, the young and the old, the strong and the weak, widows and orphans know me.
- I loom up to such proportions that I cast my shadow over every field of labor, from the turning of every grinding wheel to the moving of every railroad train.
- I massacre thousands upon thousands of wage earners in a year.
- I lurk in unseen places, and do most of my work silently. You are warned against me, but you heed not.
- I am relentless.
- I am everywhere—in the home, on the streets, in the factory, at railroad crossings, and on the sea.
- I bring sickness, degradation and death, and yet few seek to avoid me.
- I destroy, crush and maim; I give nothing but take all.
- I am your worst enemy.
- I am "Unsafe Acts" ! ! !

Published by Aetna Life Insurance Co., Hartford, Conn. Use in foundry safety programs suggested to MODERN CASTINGS by C. W. Hockman, foundry superintendent, Cadillac Motor Car Div., General Motors Corp.

AFS Will Tag 'I'

Recommended good safety practices, not specific codes, will be presented in the revised Safety Manual of the American Foundrymen's Society, according to a report of the AFS Safety Committee which met in Chicago, March 8.

HYBOND *Core Oil*

...FOR FOUNDRYMEN WHO APPRECIATE THAT UNIFORMITY OF PERFORMANCE MEANS REDUCED COSTS!

New home of HYBOND CORE OIL, where increased raw material storage and complete modern laboratory facilities mean immediate delivery of carefully compounded MBI products.

"My core oil costs were reduced 12½% with HYBOND ... no change in core sand mix or baking"... Superintendent, LARGE FARM IMPLEMENT FOUNDRY

"Our actual oil costs were cut 16% when we changed to HYBOND, with baking time reduced 15%... Works Manager, LARGE AUTOMOTIVE FOUNDRY

* Taken from file of unsolicited testimonials that attest to HYBOND'S consistency of quality performance.

Drop by Drop, **HYBOND CORE OIL** meets rigid Laboratory Control Standards, insuring that this MBI product conforms to every foundry requirement:

- CONTROLLED UNIFORMITY
- FASTER BAKING
- CLEANER WORKING
- REDUCED SCRAP
- INCREASED PRODUCTION
- LOWER COSTS

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More and more foundries are realizing greater profits with HYBOND, some through initial costs, others with savings in baking time, labor, higher oil-to-sand ratio and reduced scrap. Make it a point to discuss your foundry core oil operation with a qualified Magie Engineer.

SEE US IN BOOTH 806

CIRCLE NO. 180, PAGE 13-14

Want Lower Material Handling Costs?

GET A STRAYER ELECTRIC CLAMSHELL BUCKET BIGGER, FASTER PAYLOADS WITH EVERY PASS

AC or DC, Continuous or Hook-On Service

Strayer Electric Buckets have an almost unlimited range of applications. They can be used whenever there is electricity, inside or out-of-doors. You can attach them to any type of power hoist or crane.

You'll get lower material handling costs with a Strayer Electric Bucket. Design and construction assure you of that.

Strayer's well-known design uses the enormous closing power of lever arm action plus a terrific boost with electric drive. Usually loads are greater than rated capacity. This power to dig-in never lets a Strayer Electric lift out empty. You get a full load with every bite.

From top to bottom, the Strayer is strongly built for long, steady use, even under extreme conditions. It requires very little service.

Check these features. They're only a few of the reasons why Strayer Electric Buckets mean lower material handling costs.

- Operates in its own headroom.
- Empties full or part load.
- No clutches, chain or leaf springs.
- Crane with lifting magnet needs no extra wiring.
- Wide scoops make it clean up as well as digging bucket.
- Automatic controls prevent accidental opening or closing.
- Smooth, steady action. No sudden shock thrown on crane.
- No blind rivets. Generous size bushings and hinges.
- Hooks on or off in a minute.
- Digs full or part load.

Erie Mechanical Hook-On and Two-Line Buckets Also Available in a Complete Range of Sizes

For catalogs, write Dept. M46

ERIE BUCKETS THE WORLD OVER

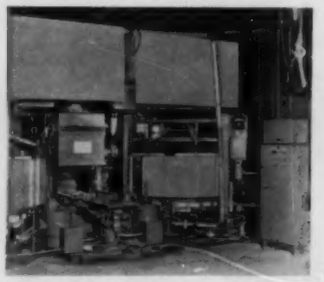
ERIE STRAYER CO.

1046 GEIST ROAD • ERIE, PENNSYLVANIA

CIRCLE NO. 181, PAGE 13-14

products and processes

Twin shell molding machine with hydraulic investment chamber roll-over and pattern rotation turns out shell molds and pastes them together from



two different patterns. An unusually fast unit, maker reports. It's called the Chicopee Twin. *Shell Process, Inc.*

CIRCLE NO. 1, PAGE 13-14

Aluminum-asbestos roof coating can cut building interior temperatures as much as 20 F. Asbestolite is made of asphalt, asbestos, oils, and aluminum flakes with leaf, can be sprayed or brushed on. *Monroe Co., Inc.*

CIRCLE NO. 2, PAGE 13-14

Slip jacket is self-aligning and can be fitted to four different sizes of molds by moving the stud to another hole.

Extra holes can be drilled by the user. Bulletin "Improved Wopper Jaw Jaket." *Products Engineering Co.*

CIRCLE NO. 3, PAGE 13-14

After-filter bags of Dacron will not burn, shrink, or be attacked by moths or mildew. They fit Torit FB cyclone type dust collectors. *Torit Mfg. Co.*

CIRCLE NO. 4, PAGE 13-14

New muller has rated capacity of 3000 lb or 45 cu ft per batch. Powered by 60 hp motor, Model 2½F has a 90" pan diameter and gives an

effective muller weight range from 1200 to 3000 lb. *National Engineering Co.*

CIRCLE NO. 5, PAGE 13-14

Electronic remote control system for traveling cranes works from the floor. Carrier current from existing power rails is the only circuit needed. Up to 8 cranes can be handled from one control. Fail-safe provision. *Femco, Inc.*

CIRCLE NO. 6, PAGE 13-14

Electric bin vibrator has two interleaving eccentric weights on each

end; the more these are closed, the more the force. Three sizes in line. *Cleveland Vibrator Co.*

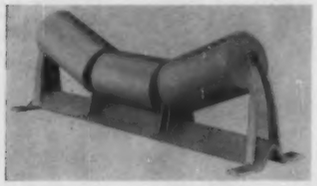
CIRCLE NO. 7, PAGE 13-14

Die casting machine is furnished as cold- or hot-chamber unit, with 400-ton locking pressure. Model 400-N casts up to 14.5 lb in zinc. Available for zinc, lead, and tin alloys or alu-

minum, brass and magnesium alloys. Bulletin 400-N. *Cleveland Automatic Machine Co.*

CIRCLE NO. 8, PAGE 13-14

Belt conveyor idlers feature unit construction, reduced deflection, accurate roll alignment. Series 50 idlers fit 7



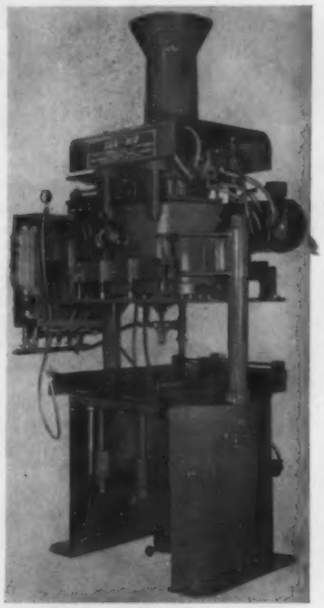
belt widths from 14 to 36". Folder 2516. *Link-Belt Co.*

CIRCLE NO. 9, PAGE 13-14

Castable refractory "Purocast-3000" shows superior performance in the 3000 F castable class. Recommended for such conditions as reducing atmospheres, carbon deposition, irregular temperatures, abrasion. *Mexico Refractories Co.*

CIRCLE NO. 10, PAGE 13-14

Core blower features a stationary, automatic-refill sand chamber. The San-Blo blows cores to 150 lb. each;



chamber holds 32 x 32" core boxes. Plenty of optional equipment fits it for many jobs. *Federal Foundry Supply Co., San-Blo Div.*

CIRCLE NO. 11, PAGE 13-14

Line of DC motors and generators has ratings from 1 to 150 hp and 3/4 to 150 kw. The Kinamatic line can operate at any speed below base,

Now, more than ever, you can depend on

HANNA

as your best source for

PIG IRON

- *Our merchant capacity is bigger than ever*
- *Our plant is better than ever*
- *Our product range is greater than ever*

The
HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New
EXCLUSIVE HANNATEN INGOT

For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

CIRCLE NO. 182, PAGE 13-14

Pangborn Rotoblast Table-Room at Worthington Corporation, Holyoke, Mass., "reduced two full shifts to one shift daily . . . gives perfect finish, cleans 2½ times faster than previous equipment."

Pangborn Rotoblast® gives "perfect" finish at Worthington Corporation!

And "cleans cleaner than pickling acid" at Brydon Brass!

Rotoblast Blastmaster® Barrel at Brydon Brass Mfg. Co., Toronto, Canada, "cleans cleaner than pickling acid . . . we're enthusiastic and completely endorse the cleaning quality."

Industrial parts today must have a high quality finish for many reasons—production facility, operating efficiency, consumer demand. Pangborn Rotoblast gives such a finish—thoroughly cleaned, uniform—and does it *quickly.* As a result, you get a top-notch cleaning job and greatly increased production with lower operating, labor and reject costs. Write for further details to see what Rotoblast can accomplish for *you.* Send for Bulletin 227 to PANGBORN CORPORATION, 1300 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Visit "Pangborn Institute" at AFS SHOW, ATLANTIC CITY, May 3 to 9

Pangborn

BLAST CLEANS CHEAPER

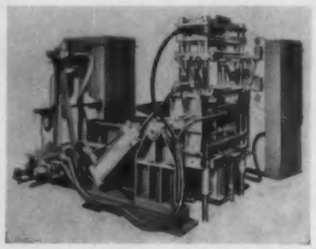
Rotoblast Blastmaster® & Continuous-Flo Barrel | Rotoblast Tables & Table-Rooms | Special Blast Rooms & Cabinets | Pangborn Dust Control Equipment | Malleabrasive® Shot & Grit

Distributors for Malleabrasive and Tru-Steel Abrasives

including stalled torque. *General Electric Co., DC Motor & Generator Dept.*

CIRCLE NO. 12, PAGE 13-14

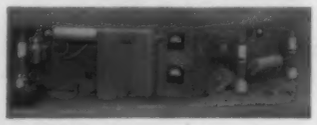
Automatic shell core and shell mold blower, Model SP-1300, operates at 50 to 90 cycles per hour. Coating and curing times are adjustable. Core box-



es and molds are the split type. It handles a 5" maximum draw, top core or mold weight of 16 lb. *Sutter Products Co.*

CIRCLE NO. 13, PAGE 13-14

Gas analyzer for hydrogen and carbon determines hydrogen content in 5 minutes. Determines concentrations



as low as 0.0002%, and handles carbon simultaneously in titanium and zirconium alloys. *National Spectrographic Laboratories, Inc.*

CIRCLE NO. 14, PAGE 13-14

Power roof ventilator is available in 5 sizes, with low- and high-speed models. Unit requires almost no maintenance. Bulletin LSQ. *Ilg Electric Ventilating Co.*

CIRCLE NO. 15, PAGE 13-14

Fork truck attachment lets the truck pick up any open-top container with

runners and dump its load. Containers must be from 15½" to 35" high. *Yale & Towne Mfg. Co.*

CIRCLE NO. 16, PAGE 13-14

CIRCLE NO. 183, PAGE 13-14

Mobile sand conditioner has a capacity of two tons of conditioned sand per minute. Power comes from 20 hp motor. Rubber scrappers push sand away from wheels and into the rap-

idly rotating brush. It's 70" wide across the brush. *Moulder's Friend Co.*

CIRCLE NO. 17, PAGE 13-14

Front-end loading tractor, TL-11, holds 1-1/8 cu yd. Front wheels drive, rear wheels steer. It's pow-

ered by either 63-hp gas engine or 77-hp diesel. *Tractomotive Corp.*

CIRCLE NO. 18, PAGE 13-14

Safety controller called the Tipp-Tronic instantly and automatically shuts off power conveyor system at predetermined load, replacing mechanical safety overload devices. *Tipp Manufacturing Co.*

CIRCLE NO. 19, PAGE 13-14

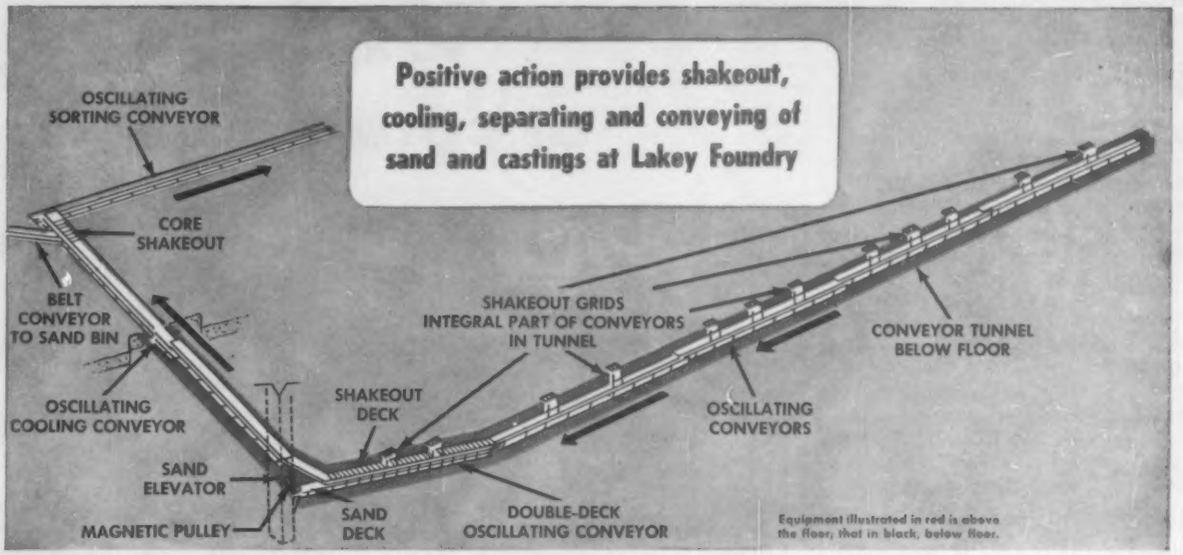
Aluminum-silicate ceramic fibre that takes as high as 2300 F now comes in rope form. Light weight and re-

silient, Fiberfrax is chemically inert and is especially useful as expansion joint packing and high-temp caulking. *Carborundum Co.*

CIRCLE NO. 20, PAGE 13-14

Insulating castable provides insulation against temperatures to 3300° F. "Alundum 33-I" is made of pure

Gets MULTIPLE-DUTY with LINK-BELT Oscillating Conveyors


Positive action provides shakeout, cooling, separating and conveying of sand and castings at Lakey Foundry
OSCILLATING SORTING CONVEYOR
CORE SHAKEOUT
BELT CONVEYOR TO SAND BIN
OSCILLATING COOLING CONVEYOR
SAND ELEVATOR
MAGNETIC PULLEY
SHAKEOUT DECK
SAND DECK
SHAKEOUT GRIDS INTEGRAL PART OF CONVEYORS IN TUNNEL
DOUBLE-DECK OSCILLATING CONVEYOR
OSCILLATING CONVEYORS
CONVEYOR TUNNEL BELOW FLOOR
Equipment illustrated in red is above the floor; that in black, below floor.

HERE'S proof that the positive action of Link-Belt Oscillating Conveyors is not affected by surges. The installation at Lakey Foundry, Muskegon, Mich., has 430 ft. of oscillating conveyors performing multiple duties in handling 185 tph of sand and castings.

Five 48-in. wide oscillating conveyors in this system are located under the floor. All have shakeout grids integral with the trough and extending above the floor. Grid units function as tight-flask shakeouts, and sand and castings drop to conveyor trough. The fifth conveyor is double-decked. Sand conveyed on the lower deck passes under a magnetic pulley to remove metal, then is discharged into a bucket elevator. Castings on the upper deck are discharged to inclined oscillating conveyors for cooling and delivery to core shakeout. A flat-top oscillating conveyor above the floor is used for picking and sorting.

Link-Belt equipment and engineering experience — which have produced installations handling up to 450 tph — can bring similar high productivity to your own foundry. For facts on Link-Belt Oscillating Conveyors, call your nearby Link-Belt office or write for Book 2444. These conveyors in standard 36-in. wide sections are available from local stocks.

At shakeout stations, oscillating motion of conveyors breaks sand from flask when flask is set on grids extending up through floor. Sand and castings fall into oscillators.

Link-Belt double-deck oscillator is fed by four other conveyors in tunnel. Top deck carries castings; lower conveys sand under magnetic pulley to bucket elevator.

Worker sorts castings from 54-in. flat-top sorting oscillating conveyor, after the Link-Belt shakeout has knocked out the cores. Capacity is 35 tph.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

CIRCLE NO. 184, PAGE 13-14

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

alumina bubbles in the range of 6 mesh and finer. It suits almost all types of operating conditions. *Norton Company, Refractories Div.*

CIRCLE NO. 21, PAGE 13-14

Binder designed specifically for large cores can cut core-making time in half. Lin-o-set has excellent storage life, is completely stable and non-toxic. Accelerators speed its setting time, and compensate for different types of sand. *Archer-Daniels-Midland Co.*

CIRCLE NO. 22, PAGE 13-14

Heavy duty grinder with self-contained dust collecting unit, Type 2 GAR, has two 12 by 2" wheels protected by safety guards. Steel wool filters are easy to replace. *Standard Electrical Tool Co.*

CIRCLE NO. 23, PAGE 13-14

Rust preventive spray known as "Rust Chek" is for use on tools, molds, dies, instruments, nested metal parts, and machinery. Comes in 12-oz aerosol can, covers about 80 sq ft. For many applications it can simply be left on during use. *Industrial Marketing Services Co.*

CIRCLE NO. 24, PAGE 13-14

Four epoxy resins for corrosion-resistant coatings can be formulated into high-grade finishes for metal or wood. Properly formulated coatings can be sprayed, brushed, or rolled on; once on, they're hard to get off again. Technical Releases 15 & 16. *Bakelite Co.*

CIRCLE NO. 25, PAGE 13-14

Flexible plastic eyeshield has a 10" nickeled screen molded integrally with plastic frame; good ventilation discourages fogging. "Airflow" fits over personal glasses, has "big-screen' vision, weighs under 2 oz. *U.S. Safety Service Co.*

CIRCLE NO. 26, PAGE 13-14

Three new arcwelding machines—a DC rectifier, an AC/DC rectifier for metallic welding, and an AC/DC Heliwelder for inert gas and metallic arcwelding—come in wide range of capacities, controls, and features. *Air Reduction Sales Co.*

CIRCLE NO. 27, PAGE 13-14

Insulator with high mechanical and electrical strength is for traveling crane trolley feeder conductors. The 504 insulator replaces hardwood conductor posts at a cost saving of 300% maker reports. It's made of polyester

CIRCLE NO. 185, PAGE 13-14

ADM presents with pride the V.I.P.* of core binders...

HOW DOES Lin-O-Set SPEED PRODUCTION?

1. Reduces man hours by 50% or more fabricating large cores.
2. Fewer rods are needed for reinforcement because LIN-O-SET cores are stronger before and after baking.
3. Average baking time is reduced by 30%.
4. Collapsible LIN-O-SET cores shake out like sugar . . . drastically reduce cleaning time.

HOW DOES Lin-O-Set IMPROVE CASTING QUALITY?

1. LIN-O-SET cores resist deformation during baking; maintain excellent dimensional stability; set up on contact with core box.
2. Sand systems are uncontaminated by LIN-O-SET.
3. LIN-O-SET cores improve casting finish.

ANY OTHER Lin-O-Set ADVANTAGES?

1. LIN-O-SET lets you accurately control set-up time regardless of operational or climatic conditions.
2. LIN-O-SET is immediately adaptable to practically all sand mixing procedures. No special measuring or mixing equipment needed.
3. LIN-O-SET cores do not produce toxic fumes or objectionable odors.
4. Normal wash procedures may be employed without damage to cores.
5. LIN-O-SET and LIN-O-SET bonded cores offer indefinite storage life.

Lin-O-Set

✱ V.I.P. means very important product—very important to foundrymen looking for ways to cut costs. More than just another binder, LIN-O-SET is a *New Method* of core making designed especially for medium-to-heavy work and especially suited to jobbing foundries. A specialized quick curing core binder that "sets up" at room temperature, the purpose of LIN-O-SET is to speed production and improve casting quality.

SOME FOUNDRIES SAY: "It's expensive *Not* to use new LIN-O-SET." For instance, these examples of heavy, intricate cores are produced in a comparatively short time and with no complications . . .

AT ST. MARYS FOUNDRY CO., *St. Marys, Ohio:*

Intricate St. Marys core made with LIN-O-SET was used to produce a horizontal boring mill head weighing 2946 lbs. and measuring 31½" x 36" x 44". Ramming and finishing this core was regularly a 5¾ hour job. With LIN-O-SET it now takes only 1¼ hours . . . over 3 times as fast.

AT STATE FOUNDRY CO., *Akron, Ohio:*

New LIN-O-SET core mix enabled State Foundry to fabricate this 1740 lb. core in 1¾ hours, a job which previously took 8 hours using conventional binder. This core, measuring 31" x 39" x 27", is used in producing a 62" vertical boring mill base.

These cores may be seen at the 1956 AFS Castings Congress, Atlantic City—Booth 1636-38

Archer · Daniels · Midland company

FOUNDRY PRODUCTS DIVISION · 2191 WEST 110th ST., CLEVELAND 2, OHIO

LINOIL | INDUCTOL | LIN-O-CEL | FRE-FLO | ADMIREZ | Lin-O-Set

reinforced with glasscloth and has two tapped inserts. *Red Seal Electric Co.*
CIRCLE NO. 28, PAGE 13-14

Etching stamps made from acid-resisting molded plastic come in four styles: peg, dowel, key-chain dowel, and pocket-clip. Acid-etch works on almost any metallic product and is permanent. *J. H. Mathews & Co.*
CIRCLE NO. 29, PAGE 13-14

Air line filters with automatic draining are for 3/4" and 1" compressed air lines. Models 11,200-6 and 11,-200-8 come with choice of filter element and special provision to prevent solids from entering the drain mechanism. Form 529. *C. A. Norgren Co.*
CIRCLE NO. 30, PAGE 13-14

Abrasive buff is designed for all ferrous and non-ferrous metals. Impregnated buff is competitive with other devices, since it needs no extra cake or compound. Conventional spacers adjust cutting action and give greater coverage. *Coated Abrasives Div., Carborundum Co.*
CIRCLE NO. 31, PAGE 13-14

Barrel finishing media look like little ceramic cones. Shape avoids lodging in intricate parts. Called "Honite Ceramicones", the long-lived media are ½" high, ⅜" through the base, 7/32" across the top. *Minnesota Mining & Mfg. Co.*
CIRCLE NO. 32, PAGE 13-14

Aluminum paint that gives a simulated hammer finish air dries in 24 hr. It is recommended for railings, ventilator outlets, machinery, etc. Known as "Halum", it resists fumes, oils, Goes on by brush, spray, or roller. *Speco, Inc.*
CIRCLE NO. 33, PAGE 13-14

Vibratory parts feeder Model EB-3-B has 36" bowl to handle parts to 8" long in either direction. It comes with single or dual discharge. Feed rate is regulated by rheostat. *Syntron Co.*
CIRCLE NO. 34, PAGE 13-14

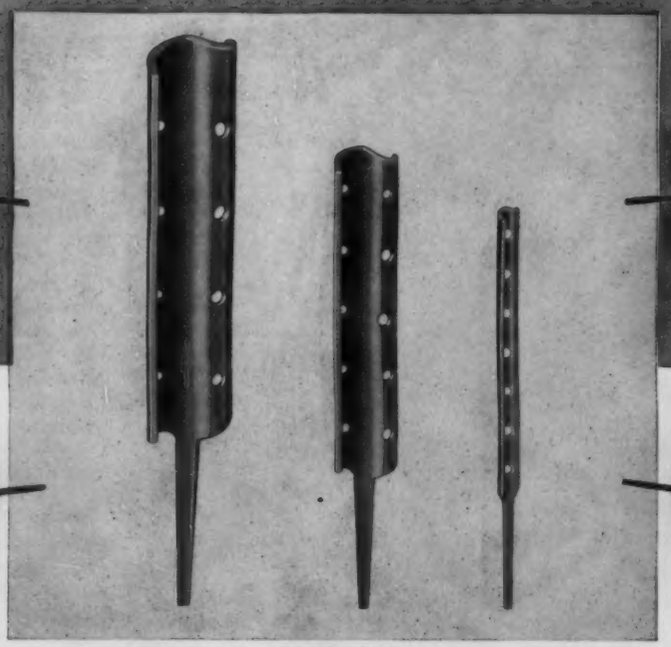
All-metal machine mount comes in 3 models ranging in load capacity from 1000 to 10,000 lb. Natural frequency of 7-10 cps absorbs noise and shock "almost completely". Adjust-O-Mount is about 8" across. Bulletin 1000. *Robinson Aviation, Inc.*
CIRCLE NO. 35, PAGE 13-14

Longer lasting linings for electric induction furnaces are provided by a new ramming mix called Alumag. Mix

CIRCLE NO. 185, PAGE 13-14

Now fine FANNER FAN-S-CHILLS

for general chilling applications—light or heavy sections



Patent Pending

WITH THE EXCLUSIVE DESIGN

THAT PROVIDES FAR GREATER CHILLING *plus* EXTRA SAVINGS IN COST

Here is a fine FANNER Chill that is winning the praise of users everywhere throughout the industry. The Fan-S-Chill is another result of the continuous research and development that have produced so many other fine FANNER Chills.

The Fan-S-Chill, through its curved "S" design offers 75% more chilling surface with less weight since there is no solid mass. Moreover because of its curved "S" design and holes which permit more thorough flow of metal it fuses and locks into the cast metal solidly and completely. Since it is light in weight it offers savings in cost, shipping and handling. Made of formed steel, it is ideal for general chilling purposes, especially in steel.

You will be interested in the many cost saving features of the fine FANNER FAN-S-CHILL, so write today for samples and prices.

SPECIFICATIONS

WIDTH — ⅝" — ¾" — 1¼"

LENGTH — ½" to 4"

Made in heavy, medium and light gauges

Copper, aluminum or tin coated

Lighter or heavier FAN-S-CHILLS in special sizes can be made on request

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

CIRCLE NO. 187, PAGE 13-14

contains a high percentage of fused magnesia and fused alumina. It comes in several different types. *Electro Refractories & Abrasives Corp.*

CIRCLE NO. 36, PAGE 13-14

Pattern repair kit is built around glass cloth and cold-setting modified epoxy coating, Kordell Foundry Kote, which

cures at normal temperatures with the aid of a catalyst. Bulletin 101 tells how easy it is to use. *Jameson Chemical Co.*

CIRCLE NO. 37, PAGE 13-14

Heat-resistant brick for foundry floors is easily applied, outlasts paving brick. Emeri-Brick measures 7.75 x 2.22 x 3.55". Put in an underlayment, set in the brick, pour in watery grout—it sets for use in 36 hours, and withstand great mechanical and thermal shock. *Walter Maguire Co., Inc.*

CIRCLE NO. 38, PAGE 13-14

Hand-held probe pyrometer Model 321 has a 19" probe and comes in two types. Chromel-alumel couple has a range to 2300 F; iron-constantan

couple has a range to 1600 F. It's for non-corrosive liquids and atmospheres. *Pacific Transducer Corp.*

CIRCLE NO. 39, PAGE 13-14

Mobile elevator has a platform that raises to 25', reaches to 16' in front of its self-propelled base, and lifts 500 lb. Operator rides the platform

at all times, controlling it from his perch. "Lift-A-Loft" comes in various sizes. *Lift-A-Loft Co.*

CIRCLE NO. 40, PAGE 13-14

Sand binder Good-Rite CB-35 is a non-curing resin offering: fast baking, negligible gas formation, excellent collapsibility, excellent shake-out, tolerance for over-baking, storage stability, and non-hazardous formulation. *B. F. Goodrich Chemical Co.*

CIRCLE NO. 41, PAGE 13-14

In-line helical gear drives come in two types. Double reduction units come in ratios from 6.2/1 through 38.4/1 with capacities to 118 hp. Triple reduction units come in ratios from 47.1/1 to 292/1 with capacities to 20 hp. Bulletin 2651. *Link-Belt Co.*

CIRCLE NO. 42, PAGE 13-14

Manganese-steel sprockets with replaceable tooth segments last up to 5 times as long as cast iron types. Wide range of sizes and types, including split wheel. Bulletin 1-56. *Taylor-Wharton Div., Harrisburgh Steel Corp.*

CIRCLE NO. 43, PAGE 13-14

Epoxy L-931 casting resin hardens in air, is self lubricating, has good impact and compressive strengths, and permits use of less expensive cores. It will cast sections to 3" thick. Data sheet 102A. *Rezolin, Inc.*

CIRCLE NO. 44, PAGE 13-14

Half-ton telescoping lift doubles as straddle fork truck, portable elevator, or shop crane. One man can run it. Lifts to 112", but collapses for working in low headroom—less than 7'. *Oster Mfg. Co.*

CIRCLE NO. 45, PAGE 13-14

Bin vibrators need no rectifiers, work off AC line at 3600 vpm. Model EU-20 is for bins to 7 cu ft; EU-30 is for bins to 20 cu. ft. Units cause a rhythmic kneading rather than a banging action. *Eriez Mfg. Co.*

CIRCLE NO. 46, PAGE 13-14

Platform trucks come with decks 18 by 32", 24 by 36", or 24 by 48". Load limits range to 750 lb. All four models in the line have solid rubber wheels and welded joints. Catalog sheet 415. *Milwaukee Truck Co.*

CIRCLE NO. 47, PAGE 13-14

Conveyor belting woven from high tension cotton warps and nylon fillers will trough and train better, has 25% lighter carcass weight, has less stretch, and operates over smaller

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pulleys at lighter speeds. *Republic Rubber Div., Youngstown Rubber & Tire Corp.*

CIRCLE NO. 48, PAGE 13-14

Variable speed polisher for preparing metallurgical specimens is adjusted between 100 and 1200 rpm by turning knob while machine is running. Table models show speed in illuminated screen. Available with wheels of 8", 12", and 16" diam and in 1, 2, or 3 unit tables. *Buehler Ltd.*

CIRCLE NO. 49, PAGE 13-14

Angle vise with swivel base allows quick, accurate setups at any angle without use of clamps, wedges, or other make-shift methods. Model 23B has 3" jaw width, 3" opening, and 1-3/4" depth. Base is graduated to 360°. Can be set at angles from 0 to 90°. *Chicago Tool and Engineering Co.*

CIRCLE NO. 50, PAGE 13-14

High heat paint is said to withstand blistering and embrittlement in smoke, fumes, mild industrial acids, alkalis, moisture, and temperatures to 750 F. HSE, silicone bolstered black pitch base, paint dries to a smooth finish in 8-10 hr without baking. Applied by brush or spray. *Speco, Inc.*

CIRCLE NO. 51, PAGE 13-14

High-speed vibrating screen has speed of 3300 rpm on 1/32" stroke, 2400 on 1/16". Incorporates new oil mist lubricating technique which prevents overheating of bearings. HS Vibrex, designed for cloth of 10 to 80 openings/in, screens wet or dry materials, requires less headroom than previous models, and handles most materials at inclinations of 10-15°. *Hewitt-Robins Inc.*

CIRCLE NO. 52, PAGE 13-14

Core box cleaner 1958 will remove soil and oils in a short time without injuring the core box or seal. It's dustless, mildly alkaline with a high percentage of detergents and stripping agents. *Pelron Corp.*

CIRCLE NO. 53, PAGE 13-14

Face shield comes in three window lengths: 4, 6, & 8". Vinyl headband is adjustable. Shield conforms to the head at all points. *Chicago Eye Shield Co.*

CIRCLE NO. 54, PAGE 13-14

Two-stage air compressors are ready in full range of sizes and mounting units feature large bore and stroke,

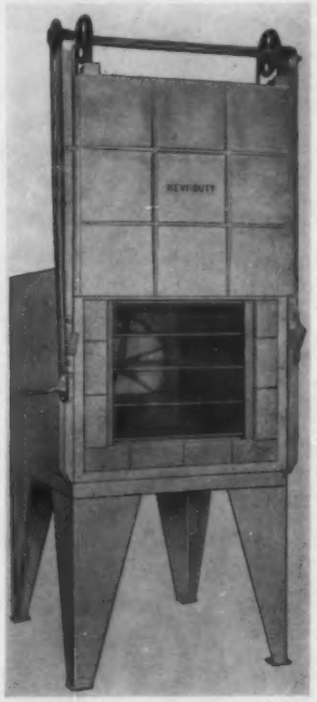
intercooler and aftercooler, slow speed, loadless start through centrifugal unloader. *Englo Products.*
CIRCLE NO. 55, PAGE 13-14

Three-wheel motor scooters come with pickup bodies able to hold 600

pounds. They load fast, unload fast, and are easy to maintain. Top speed is 35 mph. *Lambretta.*
CIRCLE NO. 56, PAGE 13-14

Metal safety frame for Styl-Ize safety lenses feature soft polyethylene nose pads and a choice of temple styles. *United States Safety Service Co.*
CIRCLE NO. 57, PAGE 13-14

Convection furnaces heat to 1350 F, and are designed to give even temperatures in all parts of the work chamber. Temperite units come in 9 standard sizes with coiled nickel-chrome wire heating elements in ce-



ramic refractories. Fan gives forced circulation. Bulletin 355. *Hevi Duty Electric Co.*
CIRCLE NO. 58, PAGE 13-14

Mist lubrication device provides positive, uniform, automatic lubrication

Do you really know your foundry production costs?

There *is* a practical way to compare your cost figures with the most progressive foundries in your area . . . to put your breakdown of departmental costs next to theirs to see where you may be out of line. Of course, identities are not necessary, so they are not revealed. Begin now to learn the up-to-date methods others have used to bring production costs more in line.

You can do this by joining a *Local Cost Group* sponsored by the Gray Iron Founders' Society. Progressive gray iron foundries are associated through 19 of these groups which meet quarterly in industry centers throughout the United States.

Regional cost consultants manage respective area cost groups and serve as your confidential C. P. A. on costs. For full information, check the coupon below and mail it to the Society immediately.

HOW TO OBTAIN ACCURATE JOB COSTS

Job costs for operating a sandslinger, roll-over, core-blower and other modern equipment must be figured differently than when these were hand operations. If you are still using simplified job cost methods after acquiring such modern equipment, your cost figures may be inaccurate.

To learn the most advanced cost methods, you should have a copy of the new *Cost Manual No. 2,* developed by a committee of foundry executives. Every foundry, large or small, will discover in this practical manual an easy and accurate way of bringing accounting practice up to date. This new manual describes *advanced cost methods* for gray iron foundries, and it also includes as a supplement the *basic cost system* as presented in *Cost Manual No. 1.* The coupon below is for your convenience.

We'll be in Booths No. 131-133 to answer questions at . . .
The 60th Castings Congress and Show, Atlantic City, May 3-9.

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Company _____

CIRCLE NO. 188, PAGE 13-14

PNEUMATIC CONVEYORS

PIPELINE SYSTEMS FOR MOLDING OR CORE SAND

MOVES FOUNDRY SAND FROM MULLER TO HOPPERS IN SECONDS . . . *Automatically!*

Whirl-Air-Flow is a pneumatic conveyor system for moving all types of foundry sand mixes and similar heavy materials rapidly, efficiently and at low cost. The main components are the Transporter, Pipe Line, Control Cabinet, Booster Fittings, Transfer Switches and Receivers — all engineered and installed as a complete system to meet individual requirements. Complicated conveyors, belts, bucket elevators and the motors to run them, are eliminated.

SAVES *time, labor and equipment*

AUTOMATIC TRANSFER SWITCHES
offer unlimited "take-off points"

Transfer Switches and pipe line flexibility permit delivery of material to any location. Work stations and storage can be located where desirable for best operation. Each Transfer Switch provides two-way distribution as illustrated below.

TRANSPORTER-SWITCHES-SAND RECEIVERS
— all push button controlled

Instant push-button control of entire system, by one man, from dust tight Control Cabinet at Transporter location gives you material exactly where you want it in seconds . . . as convenient as water from a faucet! Achieving a new low in operating and maintenance costs.

SEE
Our Working Exhibit
BOOTH 1326
60th
CASTINGS CONGRESS & SHOW

Write Dept. 30 describing your foundry layout. Our engineers will give you the facts on how Whirl-Air-Flow can serve your plant.

WHIRL-AIR-FLOW CORPORATION
4937 FULLERTON AVENUE CHICAGO 39, ILLINOIS

CIRCLE NO. 189, PAGE 13-14

without waste on open gears, chains, etc. MistOmatic Spray Control eliminates over-oiling, saves man-hours reduces fire hazard. *Lincoln Engineering Co.*

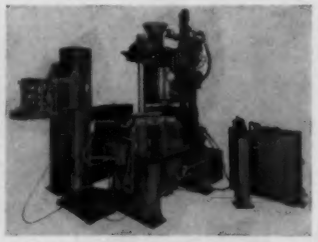
CIRCLE NO. 59, PAGE 13-14

Vibratory feeder comes in 3 models for many types of loose bulk material from chunks down to fine powders.

Unit needs no rectifier; it's the electro-permanent magnet type. *Eriez Mfg. Co.*

CIRCLE NO. 60, PAGE 13-14

Stack-mold-blower comes with 3-station turn table and automatic stacking unit. It can produce mold sections on a 17-second cycle. San-Blo han-



dles flasks to 18 x 18 x 6" with a 5" pattern draw. *Federal Foundry Supply Co., San-Blo Division.*

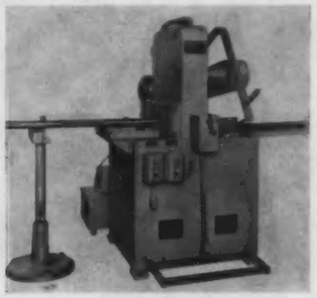
CIRCLE NO. 61, PAGE 13-14

Tumbling barrels come in 5 sizes, with capacities to 23 cu ft or 1500 lb. All are available with round, octagon-

al or flask type shells, with or without neoprene lining. Push-button control and power tilt eases operation. *Globe Div., Casalbi Co.*

CIRCLE NO. 62, PAGE 13-14

Wet abrasive cutting machine handles almost any metal or other hard material. Designated Model 64 Oscillating Wet Abrasive Cutamatic, it is hand-fed while its work clamps are operated through foot treadle. Ten



hp motor lets it chew through 3" solid material, 4" tube, or 6 x 1" steel plate at 4 seconds/ sq in. *American Chain & Cable Co., Inc.*

CIRCLE NO. 63, PAGE 13-14

Rider-type power sweeper known as Model 50 cleans a compact 28" path, is designed for cramped quarters. It's

five feet long and turns in its own length. Top speed: 8 mph. Cleans 80,000 sq ft/hr. *G. H. Tennant Co.*

CIRCLE NO. 64, PAGE 13-14

Power buggy handles like a car, is very maneuverable, and travels at 17

mph, empty. Heaped capacity of scoop is 13½ cu ft of bulk material. *Creative Metals Corp.*

CIRCLE NO. 65, PAGE 13-14

Sand preparation unit called "Molder's Helper" provides overhead sand for up to four molding stations. Used with any Simpson Mix-Muller to pre-

pare, elevate, aerate, and store sand. Can be fitted into specific layouts. *National Engineering Co.*

CIRCLE NO. 66, PAGE 13-14

Hardness tester known as "Oppel" covers the five most used scales, offering lab accuracy plus easy han-

dling. Just being introduced here, supplier says it's famous throughout Europe. *Company for Technical Progress.*

CIRCLE NO. 67, PAGE 13-14

Silicate base core binder with an unusually high T/C factor has excellent dimensional accuracy. Called "See-O-Two," it's offered in special formula-

tions to meet specific conditions. When squirted with carbon dioxide, it sets in 20 seconds. *Prenco Products, Inc.*

CIRCLE NO. 68, PAGE 13-14

Steam or air vibrator called "Vibrolator SAH-10" weighs only 4 oz, is designed for hoppers, feeders, molds,

The hitch was in the mix

. . . or how Chuck Wright cured faults of thick and thin

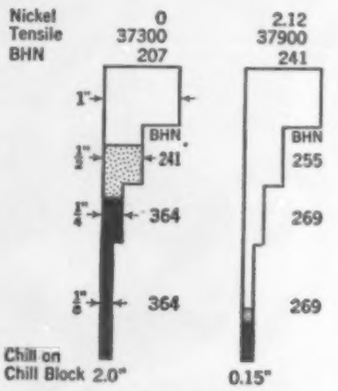
"Abbott Foundry got an order for air-cooled compressor cylinders that kept the place humming. But not the way you think," declared Chuck.

"The customer, of course, figured on high speeds and heavy cuts. Quick passage through the machine shop. After all," added Chuck, "you fellows know that *machinability* is one of the chief reasons why iron is so popular for production castings.

"But," continued Chuck, "a compressor cylinder needs something more. It must be *tight.* Especially where heavy and light sections join. Abbott's weren't. Quite a few came back.

"Wasn't a thing wrong with Abbott's practice. The hitch was in the mix. It had too much carbon and silicon to assure density, but Lex Snell, the mainstay at this foundry, was really worried . . . afraid to reduce them because he feared chill in light sections that called for machining.

"From my briefcase, I pulled out a binder of charts to show Lex some step-bar tests. Like this:



"On his desk was a leaker. Pointing to where it needed machinability, and then to where it needed tight iron, I said, 'Lex, whatever these sections, lower your carbon and silicon. Add 1.25%-1.50% nickel to get rid of chill, and you'll have iron that's tight as a drum, and machinable throughout.'

"Lex asked, 'How can you machine the casting if it's so tight?'

"Here's the answer: structure . . . not just hardness . . . determines machinability. And structure also determines pressure tightness.

"This tip paid off for Lex just as it has for others. So when *you* are up against a problem involving the metallurgy of castings . . . call me over. I may have a tip for you. Best way to reach me is through INCO."

Chuck Wright

INCO TRADE MARK

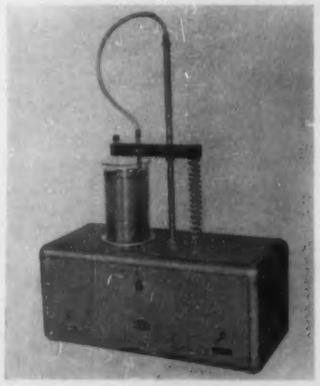
The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

etc. Frequency is infinitely variable from 0 to 50,000 cpm; operating pressure may vary from 5 to 150 psi. *Martin Engineering Co.*

CIRCLE NO. 69, PAGE 13-14

Clay tester cuts the time required for the standard AFS clay determination test. The Autoclay is fully automatic with two solenoid valves for filling



and syphoning, an electronic device to control amount of water in the jar, and relay sequence circuit. *Harry W. Dietert Co.*

CIRCLE NO. 70, PAGE 13-14

Tuckaway drawing board zips back into its own drawer under any desk or table when not in use. Unit comes complete: drawer, board, parallel rule. Attached by bolts or screws. *Arnot-Jamestown Div., Aetna Steel Products Corp.*

CIRCLE NO. 71, PAGE 13-14

Drum and barrel truck called "Ezy-Rol" reportedly lets one man set heavy drums up on pallets. Truck's

shoes are put on the edge of the pallet and serve as a fulcrum. *Valley Craft Products, Inc.*

CIRCLE NO. 72, PAGE 13-14

Chain blocks and trolleys: new series of lightweight spark and corrosion resistant aluminum units come in ¼, ½, 1, and 2-ton capacities. Well suited

...FASTER PRODUCTION OF FINER-FINISH CASTINGS
AT LOWER COST
WITH
DELTA FOUNDRY PRODUCTS
DEVELOPED IN LABORATORY RESEARCH . . .
FOUNDRY TESTED AND APPROVED . . .
SCIENTIFICALLY CONTROLLED
EVERY DELTA Foundry Product is backed by continuing and exhaustive laboratory research to safeguard quality and maintain absolute uniformity of the finished product. Every step in the manufacturing processes is under strict laboratory control and all raw materials must conform to rigid quality specifications.
Delta Oil Products Co. not only pioneered the development of plastic-type core and mold washes but has continued to lead in the development of new and improved products for the production of better castings — faster and more economically.
Delta sales technicians are ready, at all times, to assist in the more effective and more economical use of core oils, core and mold washes and sand additives for increased efficiency and lower production costs.
Get the facts...
Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.
Visit us...
AT OUR BOOTH 1525 during the 60th Annual American Foundrymen's Society Convention and also at the Traymore Hotel.

CIRCLE NO. 190, PAGE 13-14

CORE AND MOLD WASHES:

FOR STEEL:
- *Special Core and Mold Wash Base
- *SteelKoat
- *PyroKoat-S
- *SuperKoat
- *ThermoKoat
- *Z-Koat
- *ZZ-Koat

FOR ALL TYPES OF SAND CAST METALS:
- *ThermoKoat
- *Z-Koat
- *ZZ-Koat
- *SuperKoat

FOR GRAY IRON AND MALLEABLE:
- *GraKoat
- *BlacKoat
- *SuperKoat
- *BlacKoat C-2
- *BlacKoat C-4
- *DriKoat B-3
- *DriKoat B-5
- *BlacKoat S-5
- *PyroKoat-S
- *PyroKoat-G

FOR NON-FERROUS METALS:
- *NonferrusKoat
- *SuperKoat
- *GraKoat
- *DriKoat F

* *A Foundry First — by Delta.*

PARTING COMPOUNDS:
- *Partex
- *Super Partex
- Liquid Parting
- Liquid Parting Concentrates

MUDDING AND PATCHING COMPOUNDS:
- *Sliktite
- *Ebony

MOLD SEAL COMPOUNDS

*NO-VEIN COMPOUND

MOLD SURFACE BINDERS—Liquid

*DRI-BOND

BONDITE

CORE ROD DIP OIL

CORE OILS

LIQUID RESIN BINDERS:
- 155-X Fast-Dri
- 168-X Fast-Dri
- 191-XX Fast-Dri

FOR SAND
- *Permi-Bond (sea coal replacement)
- *Sand Conditioning Oils
- *96-B Sand Release Agent

FOR SHELL MOLDS
DELTA-Dietert Process Binder 103XX
(For "D" process shell cores.)

DELTA

DELTA OIL PRODUCTS CO.
MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

CIRCLE NO. 190, PAGE 13-14

for hazardous or corrosive atomspheres. *Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore.*

CIRCLE NO. 73, PAGE 13-14

All-hydraulic pallet truck has two speeds forward, two in reverse. With a two-ton load, it makes 3 mph. Truck

has a heavy, all-steel arc welded frame and safety tread platform for driver. *Colson Corp.*

CIRCLE NO. 74, PAGE 13-14

Electric chain hoist models have capacities from 1/8 to 1 ton. "Lodestar" hoists feature lifetime lubrication, load-limit motor, self-adjusting electric brakes, easy maintenance, welded chain, extremely light weight. Bulletin Insert 211. *Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.*

CIRCLE NO. 75, PAGE 13-14

Clamping arms for handling cartons or packages without pallets is the latest attachment for Hyster models

UC-30 and YC-40 fork trucks. It works by side pressure, the way you'd pick up a row of books. It's called "Cart-N-Grab". *Hyster Co.*

CIRCLE NO. 76, PAGE 13-14

Electronic potentiometer-recorder of null-balance type requires only an external sensing device. The Series 8000 units measure, indicate, record,

now...

LINDBERG-

FISHER

Electric

RESISTANCE

FURNACE WITH...

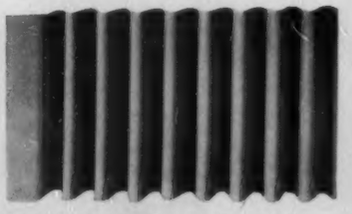
CORRTHERM

HEATING ELEMENT

For permanent mold, sand casting, and die casting of aluminum, magnesium, zinc and lead, Lindberg-Fisher now offers its improved Electric Resistance Furnace with the revolutionary new CORRTHERM Heating Element.

Lindberg-Fisher ER Furnaces have, time and again, meant lower cost per lb. of finished casting. And with practically indestructible CORRTHERM elements, lower furnace maintenance costs and longer crucible or pot service assure you of even greater savings.

These furnaces eliminate localized heating of metal, and gas absorption, because no products of combustion are present. No exhaust fumes or smoke means less operator fatigue and higher production. Investigate the advantages of this furnace. Write for Bulletin No. 321.



CORRTHERM elements are large sheets of nickel chromium. They are easy to install, just hang in furnace, and operate at extremely low voltages, completely eliminating shock or short hazards.

See the Lindberg-Fisher Electric Resistance Furnace in operation at the Casting Congress and Exhibit in Atlantic City. We'll also be showing the new Lindberg-Fisher Electric Reverbatory Holding Furnace and Automatic Ladling Unit.

LINDBERG FISHER MELTING FURNACES

A Division of Lindberg Engineering Company

2440 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

CIRCLE NO. 191, PAGE 13-14

and control variables which can be resolved into electrical signals, such as temperature, speed, strain, etc. *Wheelco Instruments Div., Barber-Colman Co.*

CIRCLE NO. 77, PAGE 13-14

Automatic travel torch makes gouges as smooth as those cut by machine, on all metals. New Model L-3 is es-

pecially useful for long gouges, cuts or bevels; and where there are no intricate configurations. All factors are pre-set except feeding the electrode into the work. *Arcair Co.*

CIRCLE NO. 78, PAGE 13-14

One-ton press features versatility and simplicity of operation on such operations as assembling, riveting, punching, marking, trimming, pelleting, etc. It works on 110 v 60 cps single phase current and is self-contained for easy installation. Many excellent features. *Denison Engineering Co.*

CIRCLE NO. 79, PAGE 13-14

Portable metal hardness tester gives direct readings in Rockwell A, B, or C scales, or Brinell medium or low scales. It works on practically any

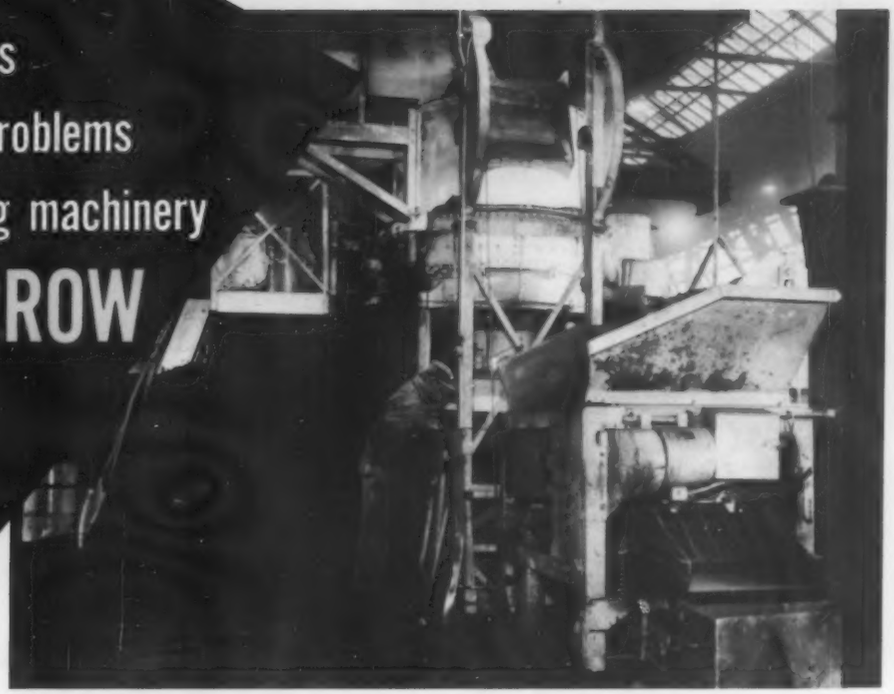
size, shape, or type of metal. Easy to operate—set it against the metal, push handgrips down, read the dial. *Newage International, Inc.*

CIRCLE NO. 80, PAGE 13-14

Abrasive blade for masonry cutting is reinforced with tough fiber glass and has extra strength around the

CIRCLE NO. 186, PAGE 13-14

solve today's mulling problems with the mulling machinery of TOMORROW



SPEEDMULLOR-PREPARATOR UNITS started the trend and have continuously led the trend towards the adoption of mulled sand practice in jobbing foundries. By providing these foundries with compact low-cost equipment to do their complete sand preparation job, these units have brought controlled sand practice within reach for the first time. One of hundreds of such units in operation, this Speedmullor-Preparator Unit is provided with a double discharge to supply conditioned and mulled sand directly to a portable Sandslinger tank from the discharge at right, and to the floor at left for delivery to molding stations by front-end loader.

MULBAROS AND LAB MULBAROS provide all foundries — large and small — with modern efficient laboratory and portable sand mulling equipment. The Lab Mulbaro is the only mullor specifically designed for use by the foundry sand laboratory. Mulling small batches of laboratory specimen size, the Lab Mulbaro utilizes removable, easily cleaned mulling bowls for precise laboratory control. The rubber-tired mulling mechanism may be tilted for easy and complete cleaning. The Mulbaro offers all of the portability features of the only really portable mullor. Only the sand need be moved in the Mulbaro's light-weight mulling bowls . . . no need to move the entire machine as in some so-called portable mixers. With the Mulbaro, two or more mulling bowls may be used with a single Mulbaro giving doubled or tripled capacity at little added cost.

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

MEMBER FEMA

Save today with the foundry machinery of tomorrow

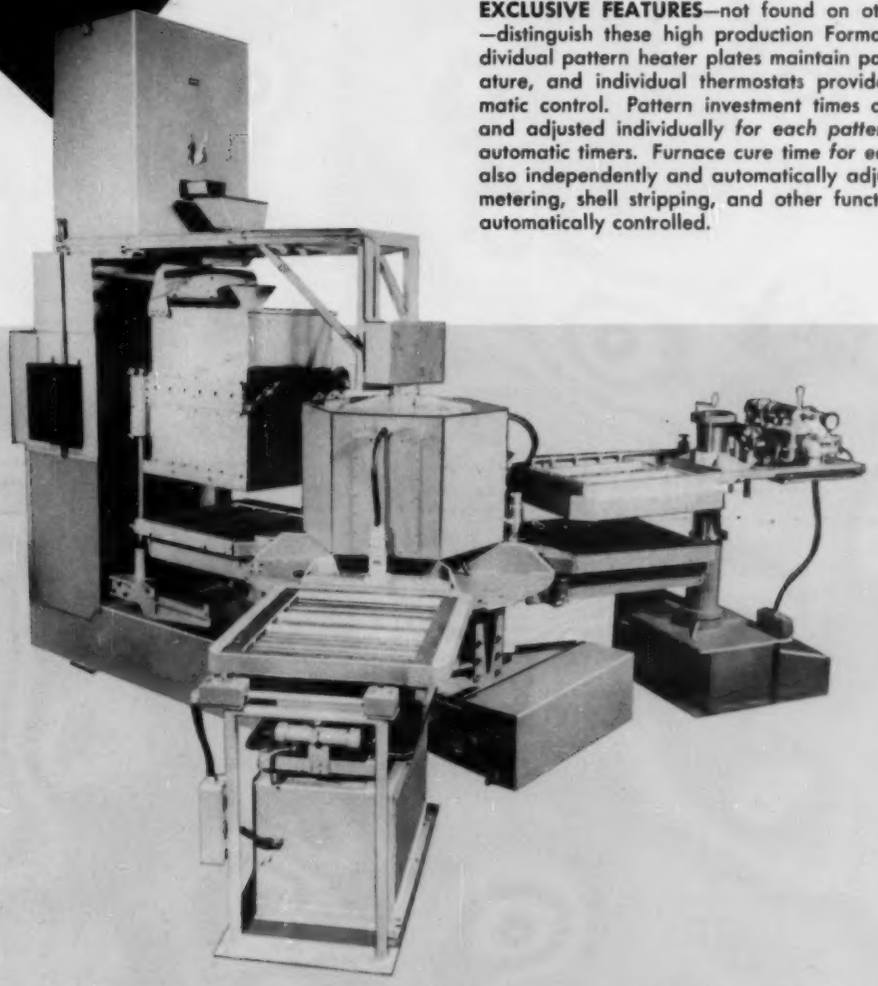
solve today's
shell molding problems
with the machinery
of TOMORROW

B & P FORMATIC

SHELL MOLDING MACHINES

Modern shell molding installations must be designed for production. That's why these Formatic Units are built to meet real production requirements. The Rotary Formatic Units are manufactured in one, two, three, four and five pattern models. It's possible to start with the simplest real production installation—a single-pattern rotary unit—and then add pattern stations as requirements increase. Production capacities range to 120 complete shells per hour. Pattern sizes up to 24 x 42 inches may be accommodated.

EXCLUSIVE FEATURES—not found on other machines—distinguish these high production Formatic Units. Individual pattern heater plates maintain pattern temperature, and individual thermostats provide close automatic control. Pattern investment times are controlled and adjusted individually *for each pattern* by precise automatic timers. Furnace cure time *for each pattern* is also independently and automatically adjustable. Sand metering, shell stripping, and other functions are also automatically controlled.



LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

MEMBER FEMA

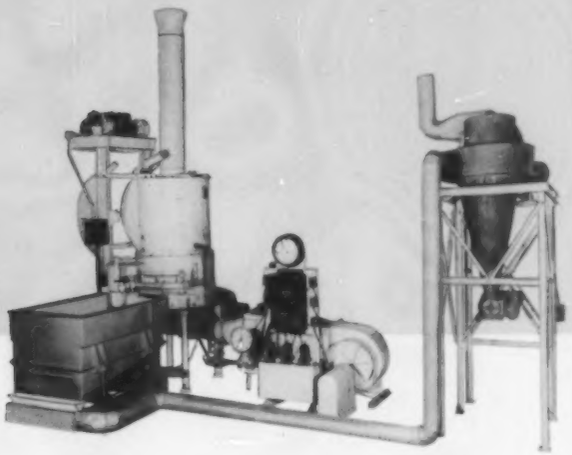
SAVE TODAY WITH THE FOUNDRY

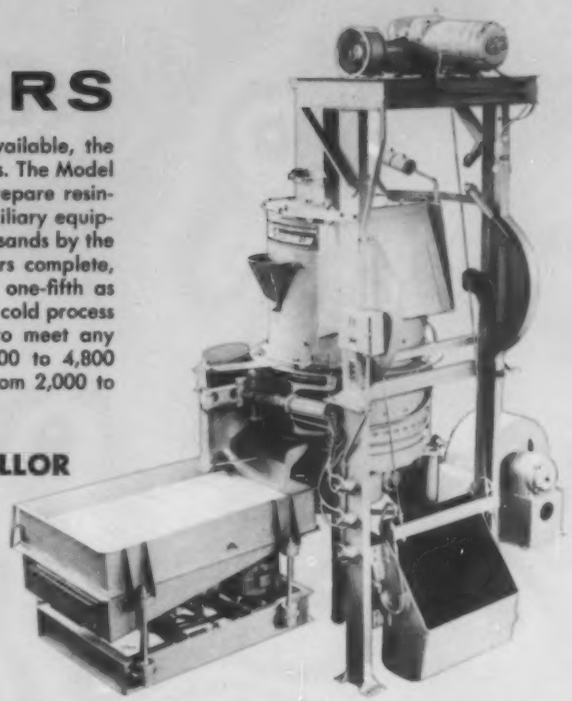
B & P SHELL SAND

SPEEDMULLORS

The most advanced shell sand preparation equipment available, the Shell Sand Speedmullors, offer dozens of exclusive features. The Model HP Shell Sand Speedmullor is the only mullor that can prepare resin-coated shell sands in a single production cycle without auxiliary equipment. For those foundries wishing to prepare resin-coated sands by the cold process, the Model CP Shell Sand Speedmullor offers complete, single unit preparation in time cycles only one-fourth to one-fifth as long as those required by other mixers. Thus, for either the cold process or the hot process, there is a Shell Sand Speedmullor to meet any foundry's exact requirements. Capacities vary from 2,400 to 4,800 pounds per hour for the Model HP Speedmullors, and from 2,000 to 20,000 pounds per hour for the Model CP Speedmullors.

MODEL CP SHELL SAND SPEEDMULLOR



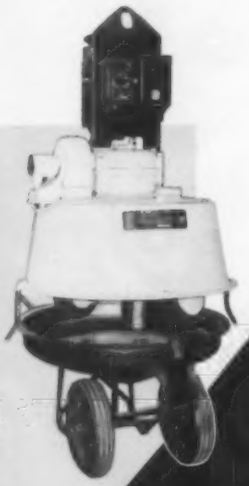


MODEL HP SHELL SAND SPEEDMULLOR

SHELL SAND

MULBARO

Specifically designed for the requirements of the limited shell molding program, the Shell Sand Mulbaro provides exact, automatically-timed preparation by the cold process. Resin-coated shell sand may be prepared for either shell molds or cores. Capacity is up to 900 pounds per hour depending on the type of sand and resin used. Like the standard Mulbaro, the Shell Sand Mulbaro may be used with several mulling barrows to provide additional capacity from a single machine. The lightweight, rubber-tired barrows are wonderfully convenient for delivering mulled resin-coated sand to shell molder or coremaker.

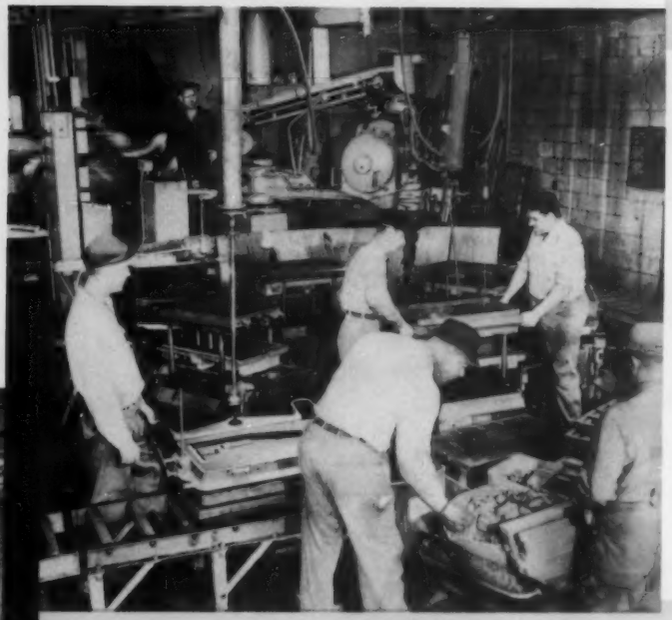


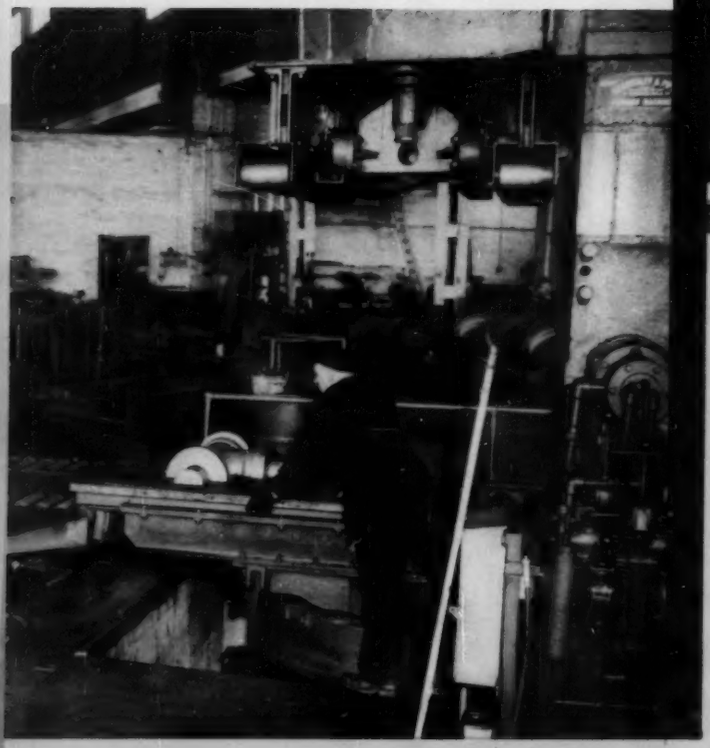
solve today's
shell sand processing
problems with the machinery
of TOMORROW

MACHINERY OF TOMORROW!

solve today's molding problems with the molding machinery of TOMORROW

HYDRA-SLINGER ROTO-MOLD UNITS truly represent the most modern approach yet conceived to the molding problems of jobbing and production foundries alike. Here, in these compact units, the foundry gains all of the advantages of high speed, multiple-station operation, without the pattern limitations imposed by ordinary production equipment. Flask handling, molding, strike-off, mold handling and finishing are all accomplished in a smooth Roto-Mold paced sequence -- yet, patterns may be changed quickly without interruption. This continuously rotating unit, utilizing Champion Speed-Draw machines, handles production work. Other Roto-Mold units, with B & P Rol-A-Draw rollover and draw machines, are designed specifically for jobbing work.





B & P ROL-A-DRAWS are now available in a full range of sizes with capacities to a full 10,000 pounds. They appreciably extend the range and application of Hydra-Slinger Roto-Mold and Sandslinger Roto-Mold Units which they are specifically designed to serve. These Rol-A-Draws offer draw capacities up to 36 inches with maximum "daylight" dimensions of 76 inches in depth. With advanced Rol-A-Draw open-end design, mold length is not limited, and mold widths to 60 inches can be handled.

Use the reader service card to request more information or write directly to:

BEARDSLEY AND PIPER
DIV. PETTIBONE MULLIKEN CORP.
2424 N. Cicero Avenue, Chicago 39, Ill.

Save today with the foundry machinery of tomorrow

Printed in U.S.A.

talk of the industry

DOLLAR DIARY portrays to American Air Filter's employees how many days of operation of the company's nine manufacturing plants were required to pay various expenses. Released with the AAF annual report, the diary is a calendar for the entire year blocked out in various colors to show where the income went. Breakdown shows: 152 days' work to pay for wages, salaries, commissions, and benefits for 2390 employees; 127 day's work for materials; 42 days, supplies and services; 23 days, taxes; 13 days, finance future growth of the company; 8 day's work to pay dividends to the 2223 stockholders.

SHOWER HEAD with a bar through it describes the dustless decoring bar reported by Colin Gresty, chairman of England's Council of Ironfoundry Associations Safety Committee. Designed by the British Cast Iron Research Association, the device keeps dust down by directing a fine spray of water onto the core at the point of the bar.

FOUNDRYMEN WILL FIND a use for it eventually although the $10,000 price tag may slow them down a bit. Unique new temperature measuring device sensitive to about 2 F creates thermal images from reflected infrared radiation that vary in color with the temperature. Originally developed for the military, the equipment works even in total darkness, requires no physical contact with object being tested.

CERAMIC CUTTING TOOLS for foundries which rough or finish machine castings? Why not. Ceramic materials are generally superior to metal in hardness, high temperature strength, and wear resistance, though usually inferior in room temperature tensile strength, ductility, and thermal shock resistance. Work reported to date is based on cemented aluminum oxide. Advantages claimed include faster cutting, better finish, no coolant needed, and long tool life between sharpening (use vitrified diamond wheel). Best tool shape and type of tool holder are still being studied.

PATTERN STORAGE seems to be creating more and more problems if our correspondence is a fair criterion of reader wishes. Several solutions to these problems will be detailed in an early issue of MODERN CASTINGS.

Herbert F. Scobie

CIRCLE NO. 186, PAGE 13-14

NOW users of SAND TRANSMISSION PIPELINES Cut Replacement Time with Non-Welded Installations of WELD+ENDS with Clamping Screws

•

Replacing sand transmission piping lines is quicker, easier with non-welded installations of WELD + ENDS with clamping screws. No threading, no special make-ready is necessary. Cut the pipe—slip the WELD+ENDS on—tighten the clamping screws . . . That's all there is to it.

Non-welded WELD + ENDS are better than flanges, especially where there is frequent replacing of pipe. They can be used over and over again with only the clamping screws requiring replacement.

Where pipeline vibration is severe, clamping screws may be equipped with Nylok lock nuts and Shakeproof washers as shown in the illustration.

Reusable non-welded installations of WELD + ENDS offer continuous savings in down time and repair costs. Write today for further information—also inquire about Plidcowear erosion-resistant pipe. Address Dept. F22

THE PIPE LINE DEVELOPMENT CO.
5700 DETROIT AVE. • CLEVELAND 2, OHIO

CIRCLE NO. 192, PAGE 13-14

YELLOWSTONE

THE SUPERIOR SAND BONDING AGENT

Molding sands containing Yellowstone Western Foundry Bentonite have been proved in test after test to have greater green strength and higher permeability. Only a small amount of Yellowstone is required because of its great strength. The superior bonding characteristics permit the use of smaller amounts of bond and less water to temper. For better casting finish and less casting defects Yellowstone is your answer.

This superior performance is a result of Yellowstone bentonite being selected from the finest deposits of colloidal bentonite at the Yellowstone mines at Greybull, Wyoming. A stockpile containing in excess of 200,000 tons and special processing equipment in the world's most modern bentonite plant guarantee uniform quality in every bag of Yellowstone.

Ask your distributor for Yellowstone Western Foundry Bentonite.

Comparative tests by an independent research laboratory* prove Yellowstone's superiority. Tests were made with an added clay content of 5%.

	GREEN PROPERTIES (a)						DRY PROPERTIES (b)	
	pH	Green Compressive Strength psi	Permeability AFS Units	Toughness psi (c)	Deformation in./in.	Hardness (d) AFS Units	Compressive Strength psi	Permeability AFS Units
Yellowstone	9.4	19.1	107	145	0.008	93	60.5	115
Western Bentonite A	8.9	12.5	92	140	0.011	86	64.3	108
Western Bentonite B	9.3	15.5	86	134	0.009	85	76.4	102
Western Bentonite C	9.7	12.9	95	136	0.011	88	29.0	108

(a) Standard AFS Procedures.
(b) Oven dried 2 hours at 220F to 230F.
(c) Product of green compressive strength (psi) and deformation (inches per inch).
(d) Hardness measured on bottom of rammed specimen.
*Name on request.

THE WORLD'S MOST MODERN BENTONITE PLANT

MAGNET COVE BARIUM CORPORATION

Safety in the U.S.S.R.

Soviet industrial safety precautions seem similar to those in the U. S., according to N. L. Bean of the Ford Motor Company who last winter toured seven manufacturing plants in Russia.

Mr. Bean reports that in the plants he visited, operators wore goggles wherever they were exposed to grinding chips.

In foundries the workers wore safety shoes, shin guards and goggles similar to those used in the United States.

There was no exposed gearing or belts. He believes that safety precautions are similar to those in the U. S. and in one foundry he saw a battery of about 40 inhalators. In another plant, with about 12,000 workers, he found enough doctors and nursing service to provide for 40,000 workers. The ratio was high because of the large number of employed women with families.

Physicians were assigned to various plant departments to study industrial hygiene conditions there and about 100 doctors and 200 nurses took care of all the needs of workers and their families.

On the other hand, the general cleanliness of the plants visited did not meet the standards of big U. S. factories with which Bean is familiar. Lighting was not up to our standards and in some cases machines were so crowded that cleanup was difficult.

Bean also saw a number of manufacturing lines that were completely automated.

CIRCLE NO. 193, PAGE 13-14

let's get personal

A. J. McDonald . . vice-president of American Steel Foundries retired April 1. He had been the Washington, D. C., representative for the firm. From 1950 to 1952 McDonald was Chief of the Iron and Steel Castings Section of the National Production Authority and he recently completed his third term as president of Steel Founders' Society of America.

Electro Metallurgical Co. announced a series of general engineering department personnel changes with **O. H. Davol** becoming manager, **S. S. Blackmore** assistant manager, and **H. M. Huse** consulting engineer.

A. Vernon Carlson . . leaves editorial post with MODERN CASTINGS to become foundry project engineer for Hardinge Mfg. Co., York, Pa.

Joseph J. Schmidt . . Chicago area representative for Lester Injection Molding and die casting machines has moved to 5875 North Lincoln Ave., Chicago.

Ted Harley . . has joined the sales department of Vesuvius Crucible Co., Swissvale, Pa.

Charles Lay . . former vice-president of Upstate Metal Casting Co., Norwich, N. Y., is now Shalco shell molding equipment service manager of Shallway Corp., Connellsville, Pa.

Archer-Daniels-Midland Co. has added to the staff of its new development department with **Donald A. Beadell** named manager of industrial chemicals development and **Dr. Verne C. Bidlack, Jr.**, assigned to work with resins and plasticizers.

Dr. A. H. Sully . . has been promoted to director of research for British Steel Castings Research Association to succeed **Professor R. J. Sarjant** who will continue in an advisory capacity.

Superior Foundry, Inc., Cleveland, has made six staff appointments: **Clem Swencki** is now foundry superintendent, **John Jaworski** is cleaning room superintendent, **Arnold Robertson** is director of quality control and development, **Clayton Stevens** is in charge of all core rooms, **Nicholas Strogonow** is chief metallurgist, and **Joshua Nuttal** is plant engineer.

Henry S. Chillas . . has been named advertising manager of Whiting Corp., Harvey, Ill. He succeeds **Anthony DeYoung** who retired March 1. Chillas has been assistant advertising manager since 1952.

Charles R. Pritchard . . general manager of General Electric Supply Co. has been named a GE v-p.

Joseph Fazarri . . operator of American Brass & Aluminum Foundry Co.,

Charles Lay

A. J. McDonald

H. S. Chillas

Pulsating neoprene panels inside the bin are PneuBin's secret weapon against bin flow bottlenecks. The PneuBin unit consists of steelbacked, neoprene, pulsating panels mounted on the inside wall of your present bins . . . and air controls to regulate the panels' action. By the pneumatic inflation and deflation of the PenuBin panels, the bin contents are positively displaced to insure free flow. After the panels have deflated, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues *automatically* at whatever frequency is set on the air controller (this frequency is adjustable).

Because the neoprene diaphragm is resistant to oils and most chemicals and is also thick and tough enough to withstand severe abrasive service, PneuBin is applicable to most any bin flow problem.

Sizes: PneuBin panels are available in ten standard sizes from 4" x 12" to 24" x 72". Special sizes can be made if required in quantity.

Send for "Flow Stoppage Report" and free literature. PneuBin engineers will gladly make recommendations, with no obligation on your part.

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MAY CORPORATION
MANUFACTURERS OF—
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CIRCLE NO. 194, PAGE 13-14

five-man Racine, Wis. shop, bought six sweepstake tickets on the Grand National Steeplechase at Aintree, England, and collected $28,000.

E. F. Schlickman

Eugene F. Schlickman . . attorney and economist joins National Foundry Association staff to direct labor and employee relations research program.

Gordon F. Simons . . has been appointed director of engineering and development for Beryllium Corp., Reading, Pa.

Louis J. Camarra . . has been named regional manager for grinding machines by Norton Behr-Manning Overseas, Inc.

Abrasive and Metal Products Co. has announced elevation of three men to vice-president. The new vice-presidents are: **W. R. Morgan,** of Birmingham; **W. H. Fellows,** of Grosse Point; and **L. B. Bellamy,** of Tiffin, Ohio.

Adam J. Kafka

Adam J. Kafka . . has joined the national sales staff of Sutter Products Co., designers and manufacturers of foundry machinery.

American Chain division of American Chain & Cable Co., Inc., York, Pa., has promoted **A. M. Roberts** from chief metallurgist to assistant to plant

CIRCLE NO. 195, PAGE 13-14

TURN OUT

800-1200 LBS. OF COATED SAND PER HOUR

WITH THIS LOW COST

NATIONAL Shell-Mull Unit!

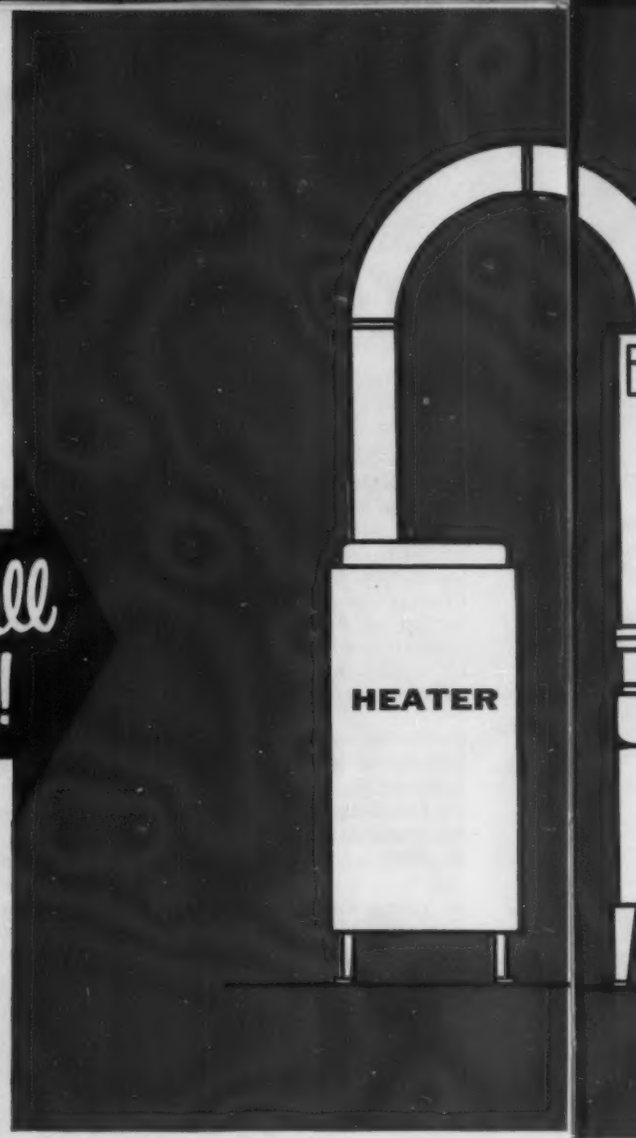
You get . . .

- CONTROLLED COATING
- LOWER EQUIPMENT COSTS

and you can . . .

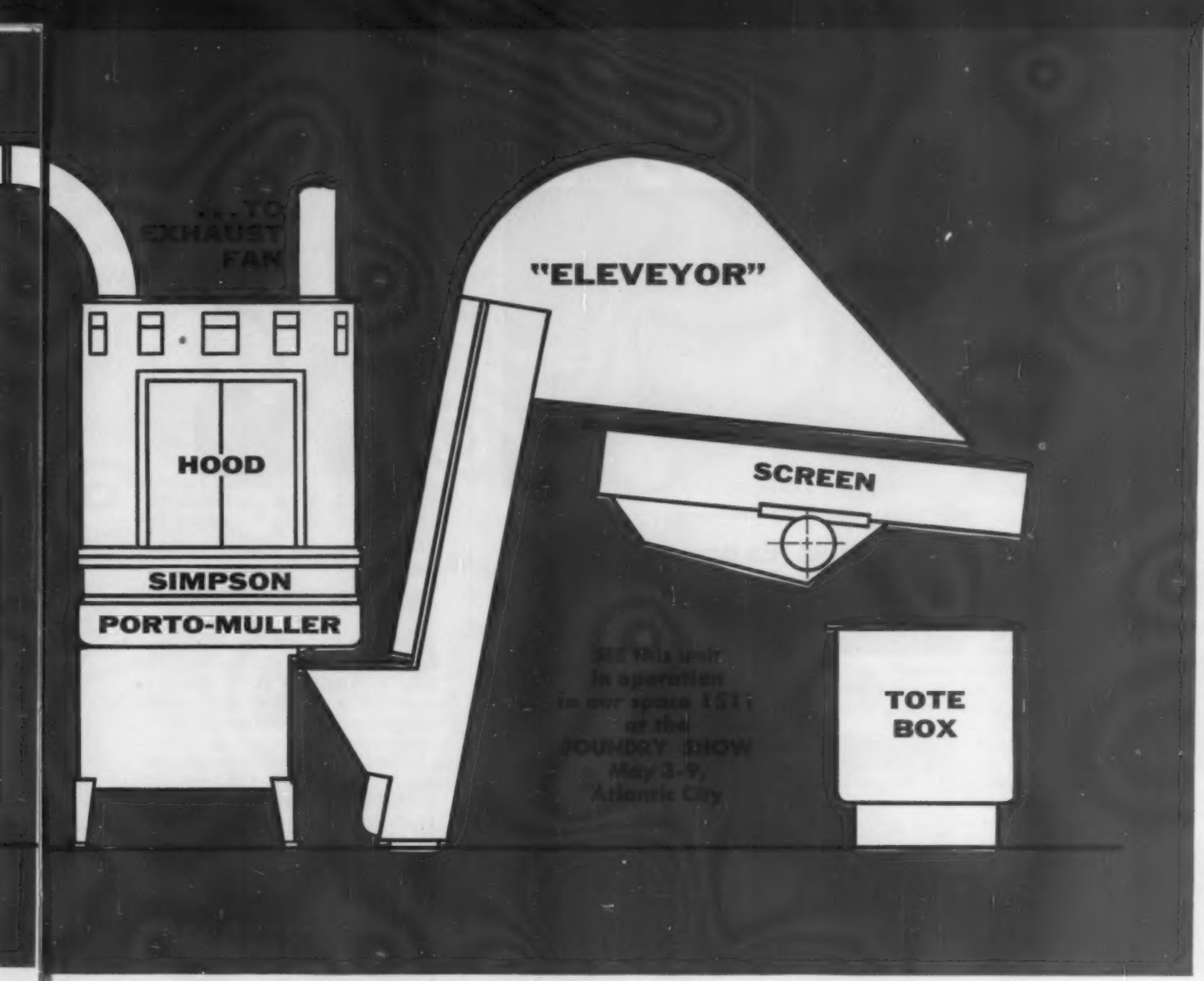
- USE YOUR PRESENT SIMPSON MIX-MULLER

Standard Porto-Muller (wheels removed) Handles 200 to 250 lbs. of coated sand per batch.



This simple, completely practical, standardized unit will turn out 800 to 1200 lbs. of coated sand per hour—every hour, with a Simpson Porto-Muller!—The same packaged deal is available for *any* Simpson Mix-Muller too! You can handle up to 4000 lbs. per batch with a 3F Mix-Muller. And if you now have a Simpson you can use it—*without* beefing up the drive.

Yes, National again proves its leadership in *progressive* foundry equipment planning with a *practical* coated sand unit. Be sure to see it, in action, at our operating exhibit in Atlantic City May 3 thru 9.



These features mean increased hourly production with positive control over coated sand.

UNIFORMITY from batch to batch. Equipment design reduces sensitivity to variation in mixing time, temperature, etc.

LARGE BATCH reduces percentage of error due to slight variations in sand and resin weight. Hot air addition results in shorter mixing cycle.

LOWER OPERATING COSTS. Standard motor and drive used on all Mix-Mullers. You use less power and get longer part life.

SEPARATE HEATER gives positive control of sand and air temperature—*independent of muller cycle time.*

UNIFORM COATING. Proven mulling action does not heat sand. Increased tensile strength can mean you use less resin to get *better* physical properties.

National Engineering Company

630 Machinery Hall Bldg. • Chicago 6, Illinois

manager and named **C. H. Raab** as new chief metallurgist. Company also has a new sales manager as vice-president **W. D. Kirkpatrick** has retired and **William B. Ilko** has been named new sales manager.

R. G. Drager

R. G. Dragar . . has been named chief engineer for York-Gillespie Mfg. Co., Pittsburgh, machinery builder.

James M. Phillips . . has been elected engineering v-p of Salem-Brosius, Inc., Pittsburgh furnace and equipment builder.

R. W. Mason . . has been named foundry plant manager of Curtiss-Wright Corp., Buffalo, N. Y.

T. K. Webb . . has been named financial control manager of Electro Metallurgical Co.

H. B. Caldwell

H. B. Caldwell . . has been appointed manager of the New York district office of the Whiting Corp.

J. Frederic Byers, Jr. . . . former executive vice-president has been elected president of A. M. Byers Co., Pittsburgh.

A. S. Klopf . . now manager of marketing for American Gilsonite Co.,

CIRCLE NO. 195, PAGE 13-14

STRESSCOAT IMPROVES CASTING DESIGN—This Magnaflux developed brittle lacquer coating is used for testing and measuring stress in working parts or designs. Stress analysis is providing new ways to reduce cost and weight of products to make them lighter, stronger and cheaper.

Case Studies: NONDESTRUCTIVE TESTING SYSTEMS

Custom testing installation for malleable castings.

New Methods Increase Profits and Expand the Market for Castings—Help Improve Foundry Practices

MAGNATEST SORTS CONTAMINATED CASTINGS by using their conductivity to measure purity. A small hand held coil induces eddy currents in parts which in turn registers on the dial. By observing changes in this current you can determine the degree of contamination. 10,000 red brass castings were recently sorted by this means at a rate of 500 per hour.

In today's economy, the profit-minded foundryman strives for consistent quality rather than perfection. This consistency pays off for both the foundryman and user.

Magnaflux offers a variety of nondestructive testing methods to aid you in achieving consistent quality in day-to-day foundry production. For instance, consistent quality starts with good casting design. M Stresscoat is invaluable for measuring stress and load concentrations, to develop designs for light, stronger and cheaper cast parts.

Magnaglo tests on pilot runs can indicate troublesome pouring or handling practices which may contribute to cracks and other defects in finished parts. With Magnaflux, Magnaglo or Zyglo methods all severe cracks in any metal can be found and evaluated. Thus, you eliminate scrapping of good castings for seemingly visible defects that have no bearing upon the true strength or service life of the casting. If serious defects do exist, proper corrective action can be taken before further costly processing. For any selected service level, M test systems permit you to set the standards and hold to them. After correct procedures have once been established, only a sampling "finger-on-the-pulse" inspection is required to insure consistent, reliable casting production. These are profitable steps to building acceptance and expanding marketing opportunities for cast parts.

For detailed information on M applications for your specific operation, call in one of our experienced Magnaflux engineers, or write today.

FOOLPROOF METHODS FOR LARGE OR SMALL CASTINGS

M offers a variety of fast, low cost, nondestructive methods for testing ferrous and non-ferrous castings of every size and shape from watch cases to valves or side frames. Whether you require a custom installation for steady production-line operation, or a portable unit for sampling tests in your production process, we can supply systems to meet your exact needs.

HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

Write for complete details concerning any of the above case studies, (excerpts from MAGNAFACTS), or ask for our new booklet on Lower Manufacturing Costs.

Take Your Inspection Problems to the House of Answers . . .

MAGNAFLUX CORPORATION

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New York 36 • Pittsburgh 36 • Cleveland 15 • Detroit 11 • Dallas 19 • Los Angeles 58

CIRCLE NO. 196, PAGE 13-14

Salt Lake City. Has charge of all sales, engineering and installation work in U. S. and 13 foreign countries. Klopf was formerly with Great Lakes Carbon.

A. A. Erkkinen

Ahti A. Erkkinen . . moves from B.I.F. Industries of Providence to Fremont Casting Co., Worcester, Mass., as general manager and director.

Miller and Co., Chicago, sole agent for Keokuk Electro-Metals Co., has **John E. Miller** company vice-president and **J. D. Kettering** assistant treasurer and comptroller.

Changes at Pratt & Letchworth, Buffalo, N. Y., division of Dayton Malleable Iron Co., Inc., move **Victor H. Bradford** in as general manager and **Dennis J. Crowley** in as assistant sales manager.

Dr. John G. Thompson . . the chief of the metallurgy division of the National Bureau of Standards has retired after more than 35 years of government service.

R. A. Aleshire

Richard A. Aleshire . . will represent Simplicity Eng. Co., Durand, Mich., from his Whittier, Calif., hq.

Brumley-Donaldson Co., Los Angeles foundry supply firm has promoted **Frank S. Brewster** from foundry consultant to director of research and

development. At the same time, **Warren A. Scott** has been promoted to sales manager, foundry division.

Richard E. Whinrey . . general manager of Link-Belt Co.'s Ewart plant in Indianapolis has been named a vice-president of the company.

Henry Klingenstein . . operator of Keystone Metal Co., Pittsburgh, was elected president of National Association of Waste Material Dealers.

Ralph E. Jopkins, Jr. . . is now assistant superintendent of Athens Foundry Corp., Athens, Pa., after serving with firm since 1949.

Robert C. Wayne . . has been named sales manager of Hamilton Foundry & Machine Co., Hamilton, Ohio.

ICI to Hold Spring Meet

The Investment Casting Institute will hold its annual spring meeting at the Hotel New Yorker, New York, May 9-11. At technical sessions scheduled for May 10 papers will cover decarburization during casting and heat treatment, techniques of producing high strength steel castings, the Shaw Process, and panel discussions on vacuum melting and gating.

Technical committees will report, among them the Dimensional Tolerance Committee (currently preparing a Design and Drafting Manual) and the Metal Specifications Committee.

Job for Retired Founder

Do you believe it is better to wear out than to rust out? Would you like to be retired but still wear lightly the harness of your castings career? Consider this. The fully equipped foundry of the Museum of Science & Industry in Chicago needs two men—a supervisor and a combined molder and general helper.

This working exhibit operates Wednesday through Sunday and on all holidays except Christmas. Fall, winter, and spring schedule is 9:30 am to 4:00 pm. Summer schedule is 9:30 am to 5:30 pm.

Anyone interested can contact Museum of Science & Industry, % Mr. Patre, Chicago, Ill. Phone number is Museum 4-1414.

Reduced Baking Time
50% Less Rodding
No Ramming
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COLD SETTING BINDER ... for castings of any size
Controlled Set Time
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CIRCLE NO. 197, PAGE 13-14

MALLEABLE
SHOT *and* GRIT

See us in Atlantic City
at Hotel Ambassador

... of dependable quality

METAL BLAST's modern methods produce better abrasives. METAL BLAST's mass production permits lower prices. That's why you'll find METAL BLAST abrasives in leading foundries . . . everywhere. If you haven't tried them — you should!

METAL BLAST, INC.

872 EAST 67th STREET • CLEVELAND 3, OHIO

THE LARGEST INDEPENDENT MANUFACTURER OF ABRASIVES . . . PRODUCING THE FINEST CHILLED AND MALLEABLE SHOT AND GRIT ON THE MARKET

CIRCLE NO. 198, PAGE 13-14

Quality Control in Aluminum Alloy Castings

This article has been excerpted from "Casting Aluminum," a new technical handbook published by Reynolds Metals Co. Copies will be sent without charge to those sending request, on company letterhead, to Desk PR4810, 2500 S. Third St., Louisville 1, Ky.

■ **Perfect castings** are generally those specified as "homogeneous and free from shrinkage defects, cracks, blowholes, porosity, hard spots, foreign matter, misruns and cold shuts, segregation, and other injurious defects." Such perfect castings are rarely made nor are they, in fact, needed. Good castings that will perform their functions without failure are made every day and they are not perfect because they do have the above defects in some degree.

The delimiting of defects should be done on the basis of the projected use of the casting. Thus a cast aluminum skillet should not have to meet the same quality standards as a piston casting, even if they are purchased by the same user. Government specifications and standards are among the worst offenders in requiring needlessly perfect castings for non-critical applications.

In any casting, cracks, shrinkage defects, misruns, and cold shuts should be cause for rejection. Some leeway should be allowed for porosity, blowholes, foreign matter, segregation, and the like. Most defects are caused by inherent limitations of the casting design and its composition, or by poor foundry procedure. With proper measures they can largely be controlled.

■ **Shrinkage defects.** The contraction of the casting during solidification and cooling can cause a number of defects. When the shrinkage damage is severe, it causes cracks and other defects such as dimensional changes and the formation of voids in the casting. Shrinkage voids usually occur in small localized areas in a casting and can be eliminated by proper feeding and cooling of the mold. The best solution to this problem is to feed molten metal at a reduced temperature to the affected portion of the cast-

ing. This can be done easily by the redesign of gates and risers, and by the use of localized chilling.

▪ **Misruns and cold shuts** are the result of improper pouring techniques. Either the pouring temperature was too low, or the molten metal was poured too slowly, or the mold chilled the molten metal too quickly, or the alloy did not have sufficient fluidity. A misrun occurs when the mold is not filled and the resultant casting is incomplete. A cold shut occurs when two streams of the molten metal meet and fail to unite, leaving an oxide film along the seam-like junction.

These faults can be eliminated in most cases by raising the pouring temperature and pouring the molten alloys into the mold as quickly and smoothly as possible. Preheating the mold and adjustment of the gating and risering will also help. Where difficulty persists, the alloy composition may have to be changed to one with more fluidity.

▪ **Cracks.** Internal or external cracks or fractures may appear in a casting because of the stresses set up in the metal during solidification and cooling, or from improper handling of the hot casting, or from the quenching during heat treatment. Improved handling methods will usually eliminate the last two sources of cracks. "Liquation" cracks which occur as the molten metal solidifies, and "hot short" cracks which occur as the casting cools just after solidification, can be eliminated by proper application of one or more of the following suggestions:

1. Change alloy composition to one with better 'hot cracking' characteristics. Tables 12, 13, and 14 list the common alloys used for casting and their casting characteristics, including 'hot cracking'.
2. Design gates and risers, and adjust chills to obtain a uniform temperature gradient throughout the mold.
3. Use core sand formulations that offer minimum resistance to shrinkage of the cooling metal.
4. Use lighter sand ramming. Use wedges in the mold next to risers. Remove the wedges immediately after pouring to reduce resistance to contraction.

CIRCLE NO. 199, PAGE 13-14

DESIGNERS
BARTLETT B-SNOW
CLEVELAND 5, OHIO
FABRICATORS
ENGINEERS
ERECTORS
Grindle DIVISION HARVEY ILL.

Now... with the addition of the Grindle Division we provide

Complete Facilities

to serve all needs of the Foundry Industry from metal receiving yard to the shipment of finished castings

In addition to.. design, fabrication and erection of Sand, Mold, Flask, Castings and Sprue Handling Systems for Large and Small—Continuous Production and Jobbing Gray Iron, Malleable, Steel and Non-Ferrous Foundries.

We can NOW furnish . . . Cupolas and Charging Systems Cupola Blowers—Metal Melting Furnaces and Accessories Dust Fume and Smoke Control Equipment—Duplex Melting Systems—Pulverized Coal Burners—Ladles—Transfer Cars.

COMPLETE FOUNDRY SYSTEMS

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BARTLETT B-SNOW
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FABRICATORS
ENGINEERS
ERECTORS

SAND, MOLD AND CASTINGS HANDLING
CLEVELAND 5, OHIO

GRINDLE DIVISION
HARVEY, ILLINOIS

5. Change the casting design to strengthen areas that show cracks. Use fillets, fins, or ribs to provide the added strength.

6. Adjust mold design to permit ready removal of the hot casting and eliminate the need for rough handling during this operation.

▪ **Gas holes** are large entrained bubbles that are frozen in the casting as it solidifies. These bubbles can be formed mechanically by agitation of the molten alloy as it flows through the mold, or the gas may have been formed by the action of the hot melt on moisture and volatile materials in the mold. These holes are similar in shape to blowholes, but are not localized in the same way.

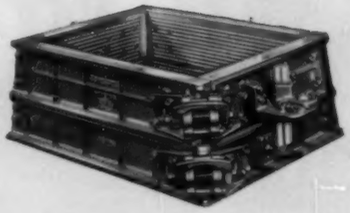
If an entrapped bubble rises to the surface of the casting, it will show up as a rounded pit in the cope surface of the casting. If the bubble does not penetrate the surface, then it will usually show up during machining, finishing, or by X-ray or destructive examination. Gas holes can be eliminated by improving the pouring technique of the molten metal and arranging the feeding system so as to reduce turbulence; and by increasing the mold permeability and decreasing the amount of moisture and volatile materials present.

▪ **Porosity** is the formation of tiny angular or rounded holes caused by the release of absorbed hydrogen from the aluminum alloy as it solidifies. These voids are usually small and evenly distributed throughout the casting, giving rise to the designation of this defect as "pinhole porosity". Usually it will only show up during machining, or on X-ray.

This defect is more severe the higher the pouring temperature and the slower the rate of cooling. Thus in any casting in which porosity occurs, it will be most severe next to gates and risers. This defect can be controlled by:

1. Improved melting and handling techniques.
2. Using proper fluxing to eliminate dissolved gas.
3. Adjusting pouring temperature.
4. Increasing permeability of the mold.
5. Changing gates, risers, and mold chills to hasten solidification

ADAMS . . . . .



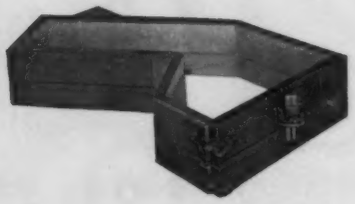
Aluminum Easy-Off Flask

Aluminum Slip Flask

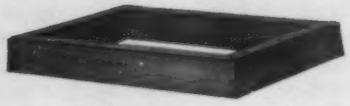
Cherry Snap Flask, tapered

Flask Equipment to meet

Cherry Snap Flask, Round with Cast Iron or Aluminum Jackets

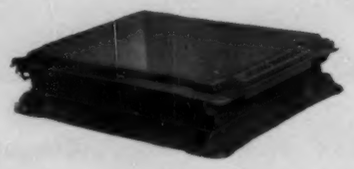


Cherry Snap Flask, Special Shape



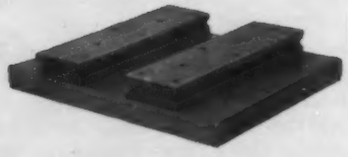
Cherry Upset

in practically all methods



Steel Jacket

Steel Band



Cherry Presser Board

THE MOST COMPLETE LINE OF FLASK EQUIPMENT

Stop and get the complete Adams Flask story at Booth 808-810 . . . 1956 A.F.S. 60th Castings Congress and Show—May 3rd to 9th—Atlantic City, New Jersey.

Pin and ear arrangement available to interchange with present Pattern Plate guides.

Handles and trunnions are available where required.

CIRCLE NO. 200, PAGE 13-14

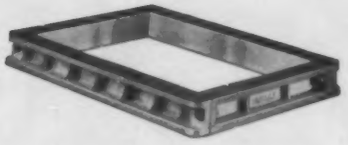
Manufacturers of

Cherry Snap Flask, straight

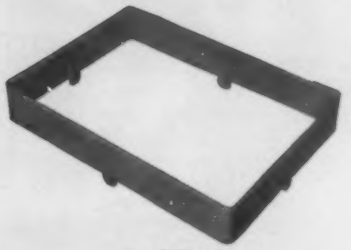
Cherry Easy-Off Flask

Cherry Slip Flask

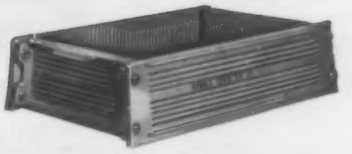
your requirements



Aluminum Upset

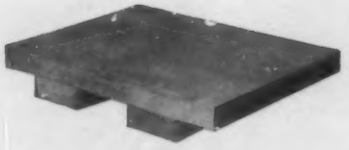


Steel Upset

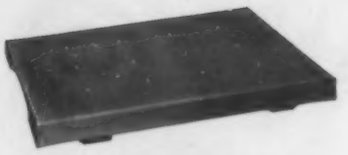


Cast Iron or Aluminum Jacket

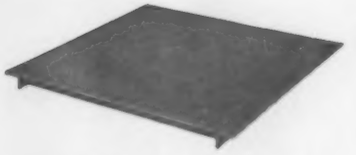
# of production



Wood Bottom Board



No. 1 Steel Bottom Plate



No. 2 Steel Bottom Plate

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER ST., DUBUQUE, IOWA, U.S.A.

and cooling.

■ **Blowholes** are caused by local evolution of gas within the mold. They are usually smooth globular cavities located on the surface of the casting. Blowholes are caused mainly by the generation of steam when the molten alloy comes in contact with overly moist sand, damp chills or inserts, improperly dried cores, or poorly dried surface washes. Blowholes are eliminated to a great extent by:

1. Increasing permeability of the mold and cores.
2. Proper venting.
3. Careful control of moisture content of mold and cores.
4. Adequately drying chills, inserts, and surface washes.

■ **Dross inclusion.** Careless foundry technique is responsible for the presence of excess oxide and dross in the casting. If these inclusions are large pieces, then an unclean furnace charge or poor melting technique can be blamed. If the inclusions are flakes, then poor fluxing, skimming, pouring, and gating are indicated. The causes of dross inclusions are easily detected and remedied.

■ **Foreign inclusions.** Pieces of refractory, supporting wires, sand, and other unwanted materials occasionally appear in the finished casting. The source of the inclusion is usually obvious, and improved technique will eliminate it.

■ **Coarse Grain.** Heating aluminum alloys above 1400 F for extended periods of time or pouring them at too high a temperature will almost always result in castings with extremely coarse grain. Aluminum alloys are best poured at temperatures 35-40 F above the highest temperature at which misruns are formed. If a casting is inadvertently overheated, it must be remelted and cast into ingots, then remelted at low temperature to refine the grain.

■ **Segregation.** Some segregation is inevitable in any alloy casting. When severe segregation results in lowered mechanical properties and lack of uniform quality in the production run, then it must be decreased. Usually segregation is caused by improper melting, or poor holding practices. Segregation that is due to the mold can be corrected by changing the gating

Compare your core-baking to this dielectric performance!

CORE QUALITY. Every grain of sand in the core gets the proper amount of heat with THERMEX Core Baking Equipment. This uniform, rapid heat avoids overbaking of surfaces and thin sections and reduces dimensional changes. Castings are more accurate and have smoother surfaces.

WORKING CONDITIONS. With dielectric core baking, there is no smoke . . . no oven heat. After baking, cores are cool enough to handle immediately, thereby moving faster to finishing and pasting operations. Core baking operations are compact.

BAKING TIME. Here, this 60 KW THERMEX Core Baking Unit reduced baking time from 16 hours to 30 minutes (compared to ovens formerly used). Cores enter unit at left, and exit at right, thoroughly baked.

PRODUCTION COSTS. Here, a THERMEX Core Baker produces more cores with one shift than formerly with two shifts. Ratio of helpers to core makers cut from 3:1 to 1½:1. Estimated yearly savings: $10,000.

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CIRCLE NO. 201, PAGE 13-14

and chilling to obtain more desirable solidification.

■ **Quality Control.** Once the quality desired in the final product is agreed upon between the user and the manufacturer an appropriate system of quality control can be established. Various inspection methods such as visual examination, pressure testing, X-ray examination, and destructive examination can be used to check on the quality of castings. The inspection used should be geared to the final quality agreed upon.

Effective quality control is needed at every step in the production of an aluminum alloy casting. It enters at the selection of the casting method, casting design, alloy, mold production, foundry technique, machining, finishing, and even inspection.

■ **Inspection.** There are four general methods used for inspection of aluminum alloy castings. These are visual inspection, pressure testing, X-ray examination, and destructive examination. Usually visual inspection methods are sufficient to check that castings meet the standards established for a production run.

■ **Inspection Periods.** Inspections can be divided into three periods . . . preliminary, intermediate, and final. Preliminary inspection consists of the examination and testing of test bars cast with the molten alloy at the same time the castings are poured. These test bars are used to check the quality of the alloy and the effectiveness of the heat treatment. Preliminary testing also includes chemical or spectrographic analysis of the casting, thus insuring that the melting and pouring operations have resulted in an alloy of the desired composition.

Intermediate inspection or hot inspection is performed on the casting as it is taken from the mold. This step is essential so faulty castings can be discarded before any further effort is expended on them.

Final inspection establishes the quality of the finished casting, using any of the four methods previously mentioned. Defective castings uncovered at this point are subjected to any salvage procedure that may be employed profitably to correct minor faults.

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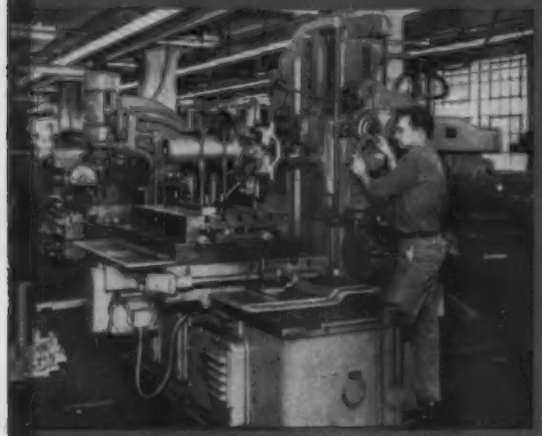
THE RESULT OF

ADVANCED ENGINEERING

Osborn's new MOL-DEX combines all the outstanding engineering advancements made by Osborn in continually improving the design of automatic equipment.



PRECISION MANUFACTURE

The manufacturing experience and skill built into Osborn's new MOL-DEX set a new standard in precision and dependability.

EXPERIENCE IN APPLICATIONS

The production economics of the new MOL-DEX are the result of Osborn's knowledge of how automatic equipment can improve foundry processes.

OSBORN MOL-DEX*

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or semi-production foundries

fully automatic molding
pattern changes—makes
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Manufacturing Company,
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See the New
MOL-DEX
in our Exhibit at the
1956 Castings Congress,
Atlantic City, May 3-9

the foundry

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CORE BLOWERS MOLDING MACHINES
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film, X-ray machine, and so on. High-contrast film gives the best picture. The X-ray apparatus must be powerful enough to penetrate the section thicknesses to be treated; thus a 2-inch section calls for a 140-kilovolt machine.

The correct use of this equipment involves the proper positioning of the casting being examined on the film, and proper interpretation of the developed picture. Examination by inexperienced inspectors will be facilitated if they are provided with a series of X-rays of rejected and accepted castings, with the defects clearly labelled.

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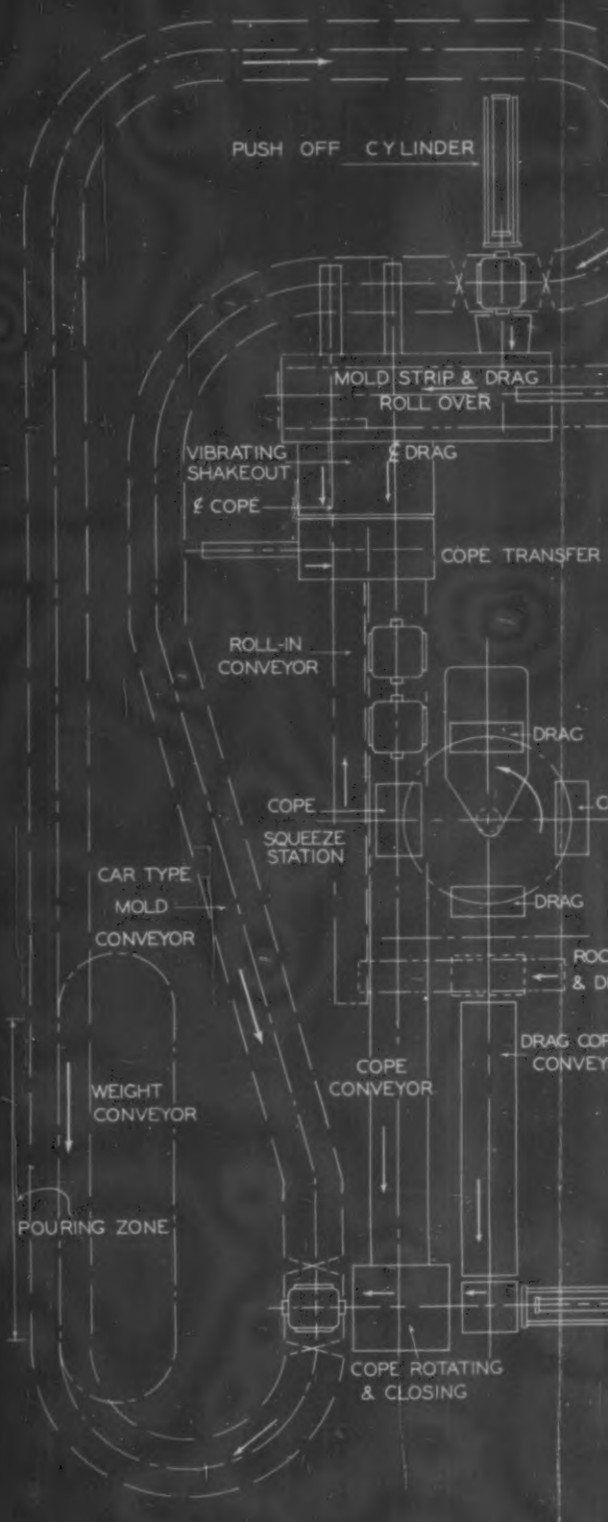
X-ray apparatus is extremely harmful to personnel exposed to its radiations for extended periods without using the proper protective devices. It is essential, therefore, that the necessary precautions be taken to shield inspectors, operators, and other personnel.

▪ **Destructive examination:** This type of inspection is being used more and more in modern foundries. It entails the taking of a sample casting from the production run, and breaking it so that the breaking load can be determined and the fracture can be examined for crack porosity, coarse grain, minute inclusions, and similar defects. Since the casting used is destroyed, it is lost to the production run.

Although the breaking of a casting is a good idea, there is no guarantee that despite the fact that no defects appear at the point of fracture, they do not exist just a few inches away. During the early stages of casting design it is of value to subject test castings to destructive examination. Macro- or microexamination of a polished specimen can be made to check for cracks, porosity, shrinkage, cold shuts, and the like.

PLAN VIEW


PUSH OFF CYLINDER
MOLD STRIP & DRAG
ROLL OVER
VIBRATING
SHAKEOUT
℄ DRAG
℄ COPE
COPE TRANSFER
ROLL-IN
CONVEYOR
DRAG
COPE
SQUEEZE
STATION
CAR TYPE
MOLD
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MOL-DEX is the first automatic molding machine to incorporate the stripping of copes and rockover of drags in a single piece of equipment. This design feature results in a greater flexibility of application than ever before achieved.

The new MOL-DEX is another example of the many progressive developments made by Osborn to improve foundry methods. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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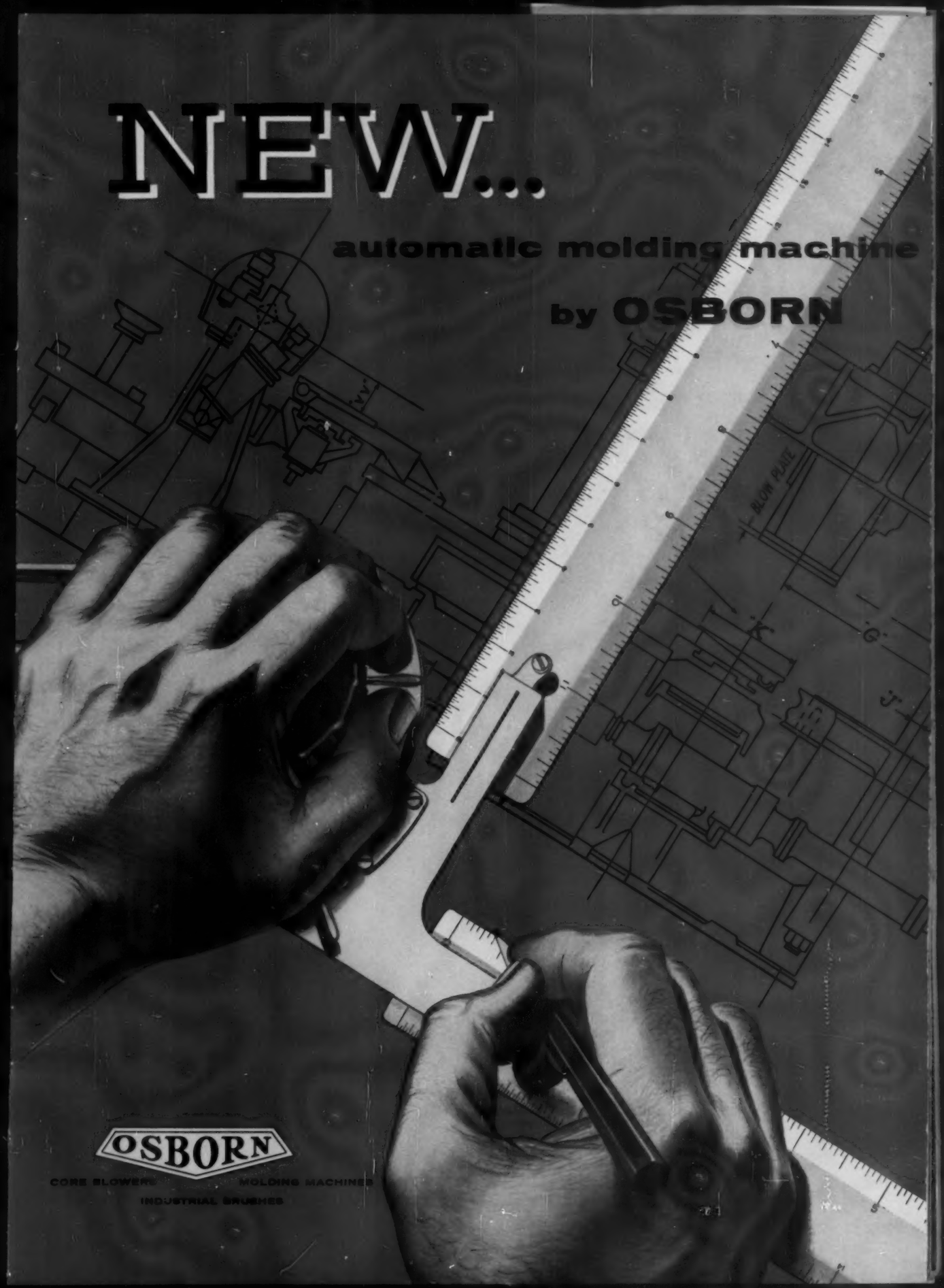
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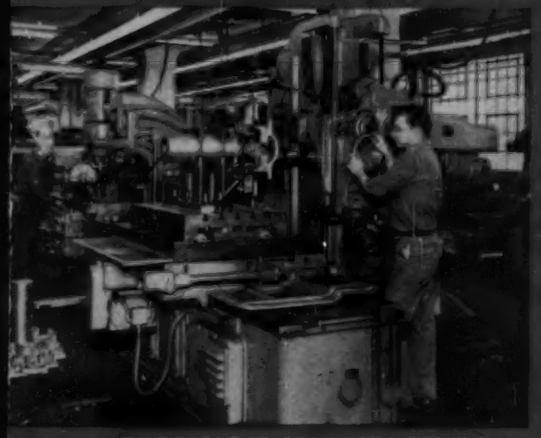

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■ **Visual inspection** involves examination of the casting for defects such as cracks, blowholes, inclusions, shrinkage and the like. The use of optical magnifiers may be helpful in detecting such faults. Visual inspection also includes the measuring and comparison of standard and actual dimensions. Dimensions of a large production run can be checked using gauges, jigs, and fixtures.

So called "chalk" and "ultraviolet" testing methods fall into the category of visual inspection. In these methods, the castings are immersed in a penetrating oil bath, the excess oil is removed, then the cleaned and dried surface is dusted with dry chalk or sprayed with liquid chalk spray and then dried. Cracks or open defects will show up as wet spots, caused by the oil held in the defects emerging to wet the chalk. The ultraviolet method is similar with the exception that the penetrating oil contains a fluorescent dye which glows upon exposure to ultraviolet light. The ultraviolet method is simpler and more efficient than chalk testing.

In many instances, the minor defects uncovered by visual inspection methods can be removed by grinding, filing, or scraping.

■ **Pressure testing** is used where castings must be pressure tight. The test is similar to that used on an automobile tube when it is tested for porosity or puncture. Cored out passages and internal cavities are first sealed off with special fixtures having air inlets. These inlets are then used to build up the air pressure on the inside of the casting to the required pounds per square inch. The entire casting is then immersed in a tank of water, or it is covered by a soap solution. Bubbles will mark any point of air leakage.

The exact conditions for this test vary with the casting and the test pressure and allowable air leakage must be established by the design engineer.

■ **X-ray examination:** Aluminum castings can be inspected using X-rays. The equipment needed for this type of examination is a darkroom equipped with the usual processing equipment, a negative viewer, stamping stencils, X-ray

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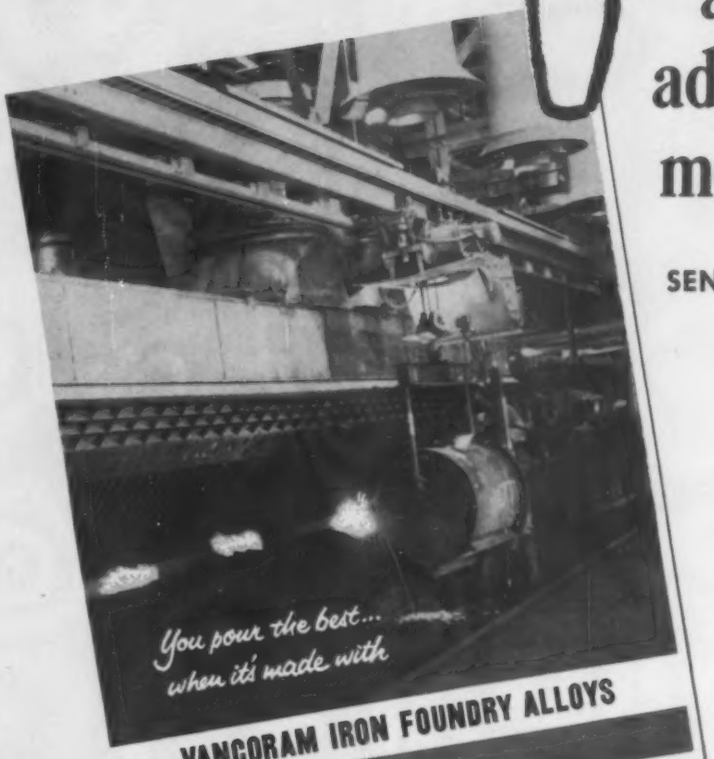

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new books

The Casting of Steel . . Newell, W. C. (ed.) viii . . 599 p. Pergamon Press, Ltd., 122 E. 55th Street, New York, N. Y., 1955, $15.50.

A group of English authorities on the various phases of casting of steel have written this book which includes: properties of the liquid metal; mechanism of solidification; melting process; use of refractories; patternmaking; mold preparation and coremaking; casting into sand molds; centrifugal formation of castings; investment casting process; heat treatment and properties of steel castings; mechanical testing—physical properties—specifications; radiography; and non-destructive testing (methods other than radiography).

1955 Book of ASTM Standards: Part I —Ferrous Metals . . 1834 p. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania. $13.50.

Contains 315 standards, 211 of which are new or revised since 1952. Standard and tentative specifications cover methods of test, and definitions for steel piping materials; flat products; bars, bolts, and rivets; billets, forgings, and axles; rails and accessories; railroad wheels; springs; concrete reinforcement; corrosion resisting steel; metallic coatings for steels; welding rods; wrought iron; cast iron; malleable iron; magnetic materials; ferro alloys; and metal powders; as well as general methods of testing.

1955 Book of ASTM Standards: Part 2 —Non-Ferrous Metals . . 1516 p. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania. $11.

Contains 270 standards, 156 of which are new or revised since 1952. Covers the coppers, leads, aluminum and magnesium, metal powders and widely used test procedures.

Engineering Manual for Control of In-Plant Environment in Foundries . . 150 p. (9-1/2 x 11). American Foundrymen's Society, Golf & Wolf Rds., Des Plaines, Ill. 1956, $6 to members, $7.75 to non-members.

Developed by the Dust Control and Ventilation Committee of the American Foundrymen's Society, this manual includes the fundamental principles of previous publications, in addition to up-to-date information in relation to modern foundry practice. Includes sections as follows: introduction to principles of foundry ventilation and industrial hygiene problems, exhaust hoods and system design, practical design of sand handling ventilation systems, molding and core making problems, general principles of ventilation for melting and pouring operations, cleaning room, industrial hygiene and miscellaneous control measures, radiation, welding and woodworking, dust and fume collectors, fans and motors, and maintenance and testing. Appendices are: Engineering Data, Name and Address of State Territorial and Provincial Regulatory Agencies, Glossary, and Bibliography. This book is unusually well illustrated.

Titanium (Metallurgy of the Rarer Metals—4) . . A. D. McQuillan and M. K. McQuillan, xx 466 p. Academic Press Inc., 125 E. 23 St., New York 10, N. Y., 1956, $10.

Book, written in England, deals primarily with the basic properties of titanium and its alloys, rather than the details of its industrial technology. Chapter on melting and casting of titanium.

Physical Properties of Solid Materials . . C. Zwikker. viii+300 pp. Pergamon Press, Inc., 122 East 55th St., New York 22. 1954.

For the physicist, chemist, engineer or research and development worker with some basic knowledge of physics. Theory and experimental results are treated and each phase of the subject is examined up to the stage where its practical application can be suggested. Lengthy mathematical discussion has been dispensed with wherever possible. Numerous photographs and illustrations.

Handbook of Acoustic Noise Control . . (in three vols.) Vol. I, Physical Acoustics, 397 pp, Dec. 1952, $4; Vol. II, Noise and Man, 271 pp, June 1953, $3, Vol. I, Supplement I, Physical Acoustics, 315 pp, April 1955, $8. Prepared by Bolt, Beranek, and Newman. Order from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

The handbook provides an overall view of the problem of noise control. While highly technical, much of the material has a practical application in foundries.

Vol. I contains an excellent account of the types and limitations of noise measuring instruments and gives detailed instruction in the correct method of making noise measurements.

In the supplement to Vol. I, a chapter is devoted to noise from ventilating fans and ventilating systems. Since more and more ventilation is being installed in foundries, it is of interest to know what effect such ventilation may have on the overall noise level. The effect of fan speed, type of fan, grills, and ductwork is explained.

Vol. II contains an excellent section on audiometry but it does not mention the importance of pre-employment or periodic audiograms. Chapter 17, Effects of Noise on Human Behavior, refers principally to aircraft engine noise which is much more intense than that occurring in foundries. The data presented discredit many popular misconceptions of the effects of noise on man.

The section on Criteria for Prevention of Hearing Loss states the difficulty of establishing valid criteria and describes the confusion that has existed among the interested professional groups.

Fundamentals of the Working of Metals . . . G. Sachs. vii+158 pp. Pergamon Press. 122 East 55th St., New York 22.

Presents an elementary discussion of basic facts which determine the success or failure of a forming operation. Divided into chapters as follows: Effects of Temperature & Speed on Forming, Relations Between Chemical Composition, Phase Changes & Forming Characteristics, Effects of Grain Structure on Forming, Some General Concepts of Metal Forming, Basic Types of Forming Methods, and Progressive Fabricating. Many illustrations. Bibliography.

Product Directory of the Refractories Industry . . 157 p. The Refractories Institute, First National Bank Building, Pittsburgh 22, Pa. 1954. $2.

Directory lists Manufacturers, Plant Locations, Product Divisions and Brand Names of Refractories manufactured in the United States.

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Transite Core Plates are strong and durable . . . resist warpage, impact and abuse, provide long service life.

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Overseas Authors Present Nine Papers AFS Castings Congress

■ Foreign authors will present nine papers during the technical sessions of the American Foundrymen's Society 60th Castings Congress and Show. The papers by foreign authors include two official exchange papers: the official ex-

Jean Duflot

M. G. Neu

change paper of the Institute of British Foundrymen and the official exchange paper of the Association Technique de Fonderie.

Foreign papers and their authors are:

Cracking and Life of Ingot-Molds, J. Duflot, Institut de Recherches de Siderugie, St.-Germain-en-Laye, France.

Fluxing and Deoxidation Treatment for Copper, M. G. Neu, Foundry Services (Overseas) Ltd., Birmingham, England and J. E. Gotheridge.

J. E. Gotheridge

W. L. Heinrichs

Hot-Blast Cupola Practice, W. L. Heinrichs, Fried. Krupp, Essen-Bredeney, Germany.

Development of Hot-Blast Cupola Melting Technique in Europe, Ernst Loebbecke, W. Strikfeldt & Co., Rhineland, Germany.

Recent Development of Coreless

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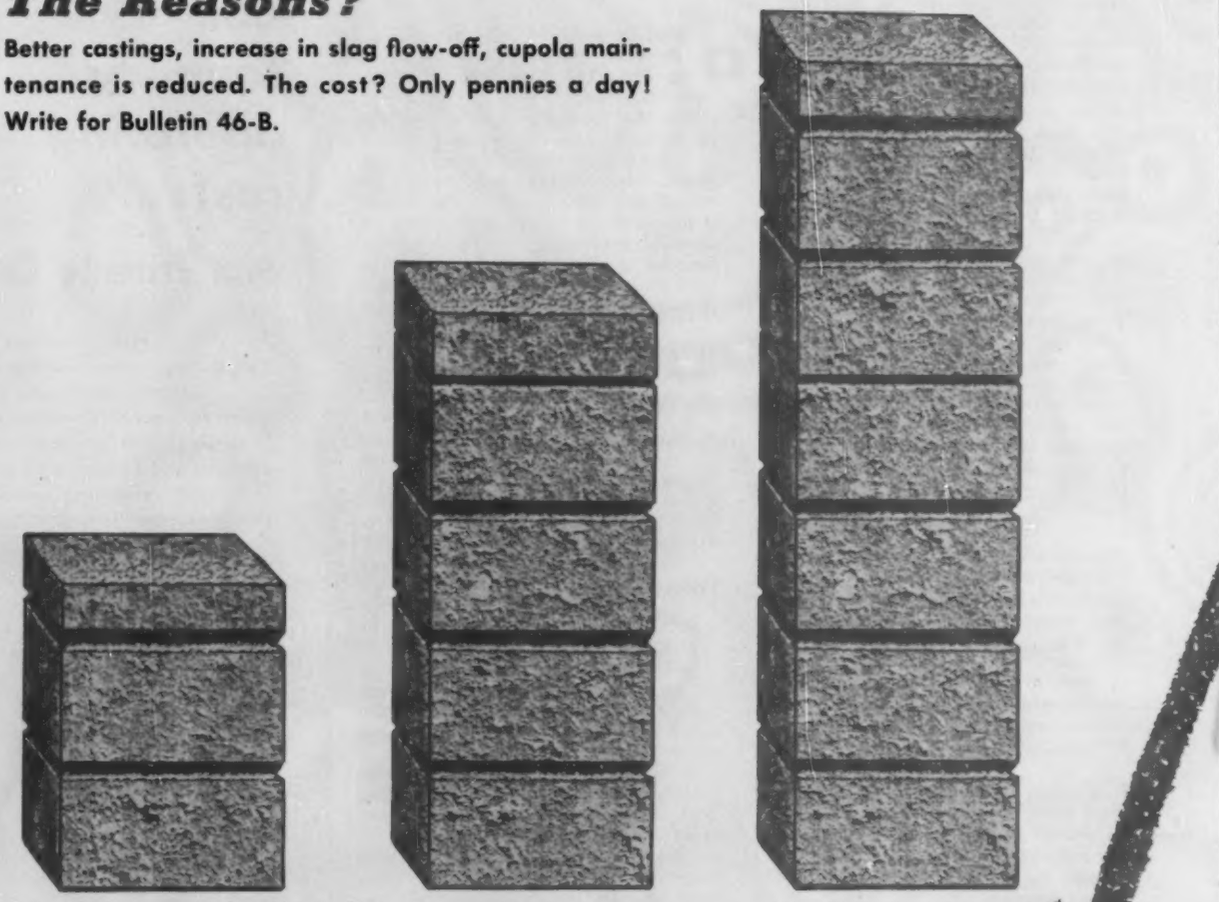

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- Saves considerable tin and other metals.
- Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A

Line Frequency Induction Melting Furnaces in European Foundries, Otto Junker, Otto Junker GMBH, Lammersdorf, Aachen, Germany.

The Carbon Dioxide Process (official exchange paper), D. V. Atterton, Foundry Services, Ltd., Birmingham, England.

Otto Junker

Ernst Loebbecke

Sub-Surface Blowholes in Gray Irons and Their Association with Manganese Sulphide Segregation, W. G. Tonks, British Cast Iron Research Association, Birmingham, England.

D. V. Atterton

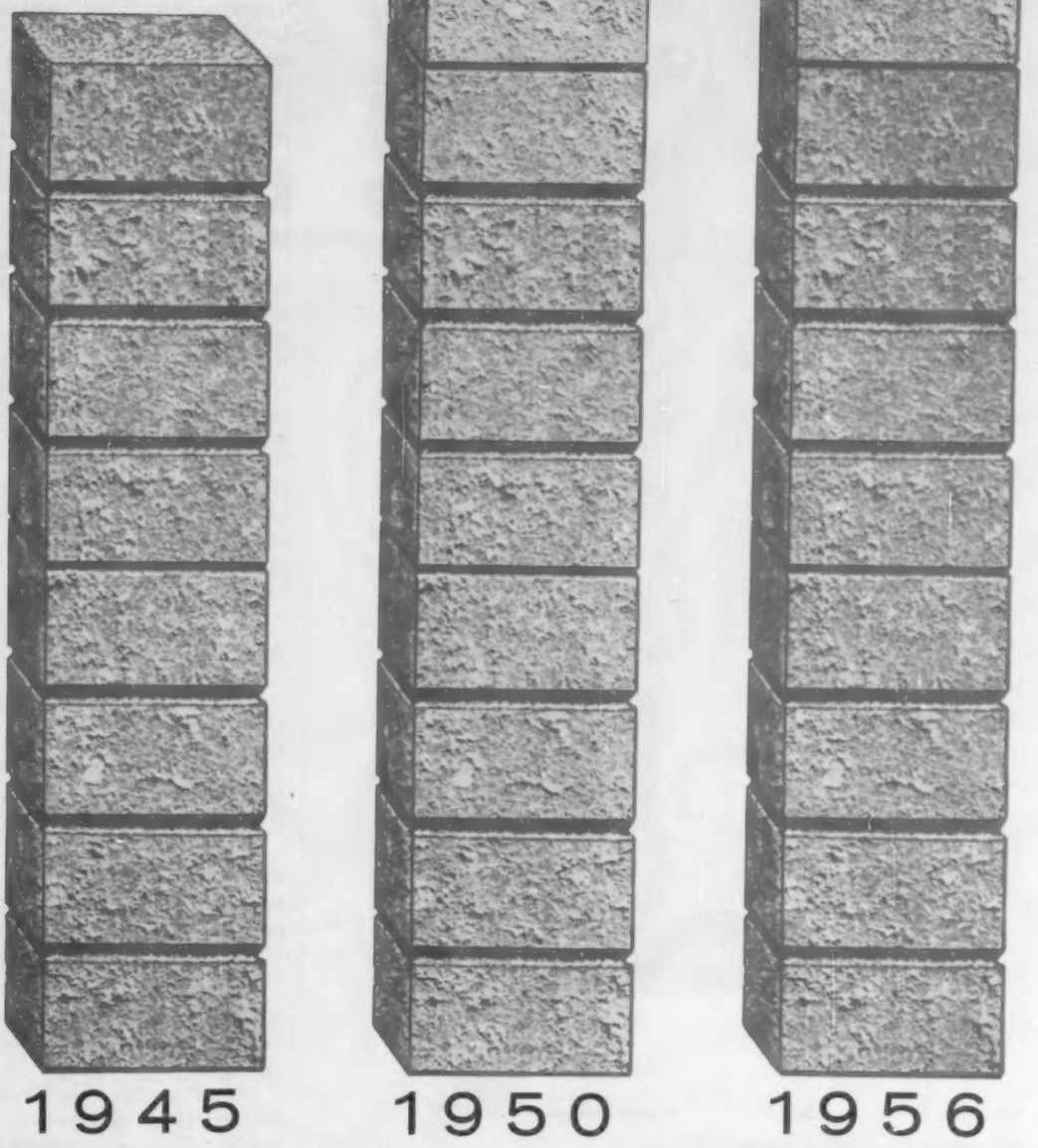
Michel Ferry

Causes and Effects of the Grain Size in Lamellar Gray Irons (official exchange paper), Michel Ferry and Jean-Claude Margerie, Centre Technique de Industries de la Founderie, Paris.

J.-C. Margerie

G. J. Vingas

Anionic or Cationic Agents—A Solution to Sand Problems, G. J. Vingas and A. H. Lewis, Dominion Engineering Works, Ltd., Montreal, Que.



The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

CIRCLE NO. 206, PAGE 13-14

LITHIUM

...the Miracle Metal

Over 100 Brass & Bronze Foundries Can't Be Wrong!

Last year over 30,000,000 pounds of copper were degasified with Lithium Metal . . . and the volume is constantly increasing. A little Lithium goes a long way. It's a fact that only 0.005% metallic Lithium makes a sounder, more uniform, nonferrous casting . . . in less time with less trouble and at lower cost.

Large size Lithium Cartridges (108 grams) are used for the degasification of large melts of copper including high conductivity metal. Small Lithium Cartridges (2¼, 4½ and 9 grams) are for foundry use in the refinement of high temperature copper, brass, bronze, and nickel-silver castings. Even the salts of Lithium (Carbonate and Chloride, especially) hold great promise for heat treating by reason of their properties in lowering bath melting points.

Is *your* foundry using Lithium? Truly the "ally of alloys," Lithium could hold the same hope for *you*. Look into Lithium. Write for details on actual foundry tests.

... trends ahead in industrial applications for lithium

LCA LITHIUM CORPORATION OF AMERICA, INC.
2605 RAND TOWER
MINNEAPOLIS 2, MINN.

MINES: Keystone, Custer, Hill City, South Dakota • Bessemer City, North Carolina • Cat Lake, Manitoba • Amos Area, Quebec • BRANCH SALES OFFICES: New York Pittsburgh • Chicago • CHEMICAL PLANTS: St. Louis Park, Minnesota • Bessemer City, North Carolina • RESEARCH LABORATORY: St. Louis Park, Minnesota

CIRCLE NO. 207, PAGE 13-14

List Foundry Wages

Wages paid in 1105 different plants, to men on 29 jobs, during the month of December, 1955, are disclosed in the *National Wage Survey of the Foundry Industry* just published by the National Foundry Association.

Wage date presented in the survey was compiled from questionnaires solicited by mail during December. The wage rates shown represent those actually in effect of December 1.

The association states that the survey has limitations in that it was necessary to arbitrarily determine the most suitable job classifications, wage intervals and labor area boundries.

Twenty-nine job classifications were selected as the basis for the report. In most cases, the survey states, the 29 are the basic occupations in the industry and the relative wage scale of other jobs fall into a pattern porportional to the wages reported.

Firms who cooperated in the survey are invited to request supplementary data from the NFA office, 53 W. Jackson Blvd., Chicago 4, Ill.

A Tomato in Your Eye

In 1951 the Army shipped from California to New York 807,000 pounds of tomatoes. During the same period the Navy shipped 775,000 pounds from the East Coast to California.

If you were still squinting from eye-straining efforts expended over income tax forms, that statement might open your eyes wide. At least the U. S. Chamber of Commerce hopes it will.

If that didn't work, try this: There is still 10.6 years supply of WAC wool uniforms purchased during World War II.

The Chamber has prepared a folder of four eye-openers describing 5½ billion in government economies said to be possible each year through the recommendations of the Hoover Commission.

The Chamber will send 25 free copies of their folder if you write: Chamber of Commerce of the United States, 1615 H Street, N.W., Washington 6, D. C.

Tips for Positioning Patterns on a Plate

■ Foundrymen often find themselves caught between the requirements of foundry practice and those of production when laying out a new job. Good practice demands that the patterns be placed comfortably on the pattern plate; production demands that patterns be packed in like sardines.

No matter how a pattern is mounted, it will need a runner. This runner should be decided upon prior to laying out the pattern, with the rest of the patterns laid out accordingly. It will occasionally happen that this will automatically space out the patterns. Two similar castings (unless they are very simple) should never appear on the same plate gated differently or run at different points.

Fitting patterns around each other as their shape allows, so that the finished plate resembles a jig-saw puzzle, then placing runners as and where space allows, is the mark of an amateur. It's obviously better to have ten good castings per mold than ten good plus four doubtful—or all 14 castings doubtful because of overcrowding.

Yield can often be improved as well. By removing two or three patterns from a 20-pattern plate, the running system can often be replanned to increase yield by 20 or 30 per cent. Patterns down the center of the plate with wide side margins is beneficial, not a waste of space.

Jamming in a few extra patterns and bringing a runner around them is actually false economy and a sign of poor planning—false economy in that the yield drops sharply, and poor planning in weakening the joint of the mold, in causing extra metal loss in remelting gates, and in the extra handling.

Following these three simple rules will help in laying out a plate as well as possible:

1. Decide where and how to gate the individual castings.
2. Space them comfortably on the plate with this in view.
3. Keep the side margins as wide as possible.

Condensed from the paper *"Gating and Risering of Non-Ferrous Alloys"* by Alan R. Moore, second prize winner in the Technical Papers Contest held by the Ontario Chapter, American Foundrymen's Society.

SEND FOR YOUR COPY

of this new illustrated brochure which shows how Shell-Molding PENN-SAND can improve the strength and permeability of your shells and the dimensional tolerance and surface finish of your castings. Mail the coupon today!

PENNSYLVANIA GLASS SAND CORPORATION
TWO GATEWAY CENTER, PITTSBURGH, PA.

Please send me, without obligation, a copy of your new illustrated brochure, "Why You Can Make Better Castings With Shell-Molding PENN-SAND."

NAME .....

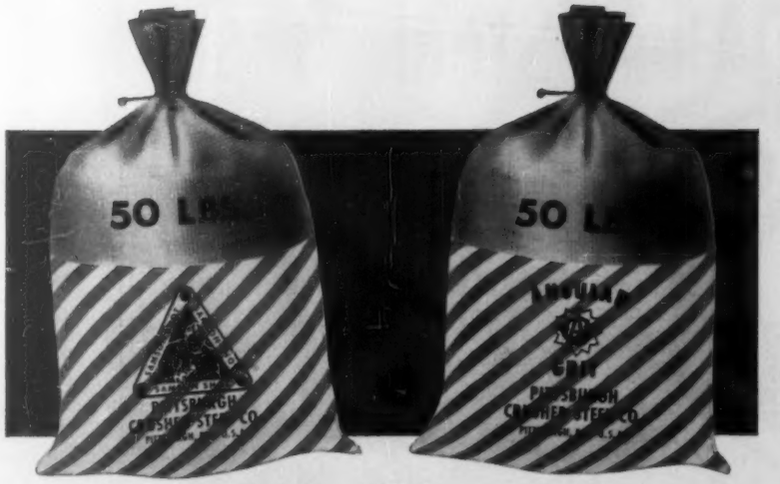
TITLE .....

COMPANY .....

STREET .....

CITY ..... ZONE..... STATE.....

CIRCLE NO. 208, PAGE 13-14



These Are the Metal Abrasives That Made Blast-Cleaning History

NOW IN 50-LB. Double Burlap BAGS

Sold and Recommended by PANGBORN CORPORATION Hagerstown, Md.

Since 1886 Pittsburgh Crushed Steel Company has led the metal abrasives industry in product research and improved manufacturing methods to produce better metal abrasives for blast-cleaning.

SAMSON SHOT AND ANGULAR GRIT are the original chilled iron metal abrasives that led in the conversion from sand to metal abrasives for blast-cleaning at the turn of the century — accepted today as the best of their kind.

MALLEABRASIVE is the original patented malleablized type of metal abrasive of greater toughness and longer life, whose development sparked efforts of all other metal abrasive manufacturers to equal it.

TRU-STEEL SHOT is the original super-tough, heat-treated and drawn steel shot of tool steel quality — since 1948 the pace setter in production of the all-steel type of shot.

PITTSBURGH CRUSHED STEEL COMPANY
Arsenal Sta. Pittsburgh (1), Pa.

Subsidiaries:
Globe Steel Abrasive Co., Mansfield, Ohio
Steel Shot Producers, Butler, Pa.

CIRCLE NO. 209, PAGE 13-14

for the asking

Shell core blower Model SCB2 pays for itself in reduced labor costs, time saved, and waste elimination, reports "Chicopee Core Chief." Four-page bulletin is well illustrated, contains ample specifications and other details. *Shell Process, Inc.*
CIRCLE NO. 89, PAGE 13-14

Thermocouples of many kinds are described in detail in 8-page bulletin. Enclosed tip portable units, complete stationary models, special models, and replacement parts are all well and clearly presented. *L. H. Marshall Co.*
CIRCLE NO. 90, PAGE 13-14

Wire straighteners are shown and specified in Catalog and Parts List CW-10, a 4-page two-color catalog. Models and parts are fully specified and illustrated. *San-Blo Div., Federal Foundry Supply Co.*
CIRCLE NO. 91, PAGE 13-14

Heaters and allied heating devices shown in Bulletin GEC-1005G include immersion, strip, cartridge, tubular, fin and switch heaters; unit heaters, soldering irons, glue pots, oven equipment, etc. Process and application index shows which to use. *General Electric Co.*
CIRCLE NO. 92, PAGE 13-14

Steel grit blast cleaning abrasive is covered in Bulletin 901-D as to sizes, applications, features, advantages, and shipping. *Wheelabrator Corp.*
CIRCLE NO. 93, PAGE 13-14

Rollover machines are pictured and described in 4-page catalog called "What Do You Want in a Rollover Machine?" Nine models, pneumatic and hydraulic types, are specified in easy-to-read table. *Beardsley & Piper Div., Pettibone Mulliken Corp.*
CIRCLE NO. 94, PAGE 13-14

Trackmobile, a hybrid hauler that runs on rails or roads, was given a 2½ yr test work-out in major plants representing a good cross-section of industry. The results are given in Bulletin T-114, 6-page illustrated gatefold brochure. *Whiting Corp.*
CIRCLE NO. 95, PAGE 13-14

Sectional belt conveyors in standardized units which capacities to 1500 tons per hr are described in 8-page

publication. Book 2579 is illustrated. *Link-Belt Co.*
CIRCLE NO. 96, PAGE 13-14

Bentonite of both kinds—western and southern—is the topic of 16-page pocket sized Bulletin 243, "Economy in the Foundry." It contains plenty of suggestions and tips on these materials. *American Colloid Co.*
CIRCLE NO. 97, PAGE 13-14

Aluminum fluxes for all types of aluminum alloys are presented in 4-page illustrated Leaflet B-1. Specific fluxes for specific alloys are shown with tips for use. *Foundry Services, Inc.*
CIRCLE NO. 98, PAGE 13-14

Dihedral couplings specified in Bulletin 60 are self-aligning, with angular and offset capacity up to a total of 3 degrees. Eight pages tell the story. *Ajax Flexible Coupling Co.*
CIRCLE NO. 99, PAGE 13-14

Miniature instruments detailed in 12-page Bulletin 7202 include indicators, recorders, and controllers for such process variables as temperature, pres-

sure, or flow. Wiring diagrams and good descriptions throughout. *Brown Instruments Div., Minneapolis-Honeywell Regulator Co.*

CIRCLE NO. 100, PAGE 13-14

Foundry equipment Catalog 69 covers flasks, flask accessories, wheelbarrows, carts, trucks, etc. Well laid out for clarity, with many illustrations in its 60 pages. *Sterling Wheelbarrow Co., Inc.*

CIRCLE NO. 101, PAGE 13-14

Kwik-Strip mechanical corner flasks shown in 2-page "More and Better Molds" actually open and close with fingertip ease. *Newaygo Engineering Co.*

CIRCLE NO. 102, PAGE 13-14

Repairing cast iron parts is the subject of fully illustrated 4-page booklet outlining the latest information on welding with Ni-Rod and Ni-Rod 55 electrodes. Nine case histories are included. *International Nickel Co., Inc.*

CIRCLE NO. 103, PAGE 13-14

Core ovens, the portable kind, are the topic of Bulletin 206. This 8-page publication shows pictures of the different models, compares them in tabular form for quick reference, and talks about such features as rolling drawers, compact design, rugged construction. *Foundry Equipment Co.*

CIRCLE NO. 104, PAGE 13-14

Snagging wheels Bulletin GS-55 contains data on 8 types of resin and vitrified bonds, plus where each is used in steel mills and steel, malle-

able, grey iron, and non-ferrous foundries. *Electro Refractories & Abrasives Corp.*

CIRCLE NO. 105, PAGE 13-14

Moisture analyzers in Bulletin SL-1 include units for accurately determining the amount of moisture in any solid, granular, liquid or semi-liquid

The HUB of Alloy Steel Production is the home of OHIO FERRO-ALLOYS

We think it might be an item of interest to all our customers to know that Ohio Ferro-Alloys Corporation was conceived almost a third of a century ago in the minds of men who were busy making Canton, Ohio the world's largest producer of fine alloy steels.

Out of their success came the capital which launched our corporation. But more important than all came the precious "on the scene, day by day experience" which now enables us to chart our course with confidence.

Here in the heart of alloy steel making America we quickly feel the changing pulse of the industry, feel the first impact of new developments

We gladly share with you, all our ferro-alloy customers, the advantages we enjoy in living next door to the world's greatest alloy steel laboratory . . . the laboratory of practical experience.

In addition to our headquarters at Canton, we have plants located for your convenience at Philo, Ohio; Brilliant, Ohio and Tacoma, Washington.

CIRCLE NO. 210, PAGE 13-14

ATLANTIC CITY EXHIBIT
May 3-9 Booth #1438

SOMETHING NEW IN SAND RECLAMATION!

AIR-RECLAIM

MAKES OLD SAND WORK LIKE NEW...

Put your waste sand into production! Eliminate costly time consuming non-productive operations!

Put costly sand back to work! Our new AIR-RECLAIM converts your sand waste into PROFIT! No limit to the possibilities for AIR-RECLAIM in any plant. More efficiency for all foundries . . . large and small.

Reclamation is our business . . . NOT A SIDE LINE!

Our sand reclamation units are engineered to suit your needs. Foundrymen can depend on HYDRO-BLAST installations to cut your maintenance costs, save time, lessen sand breakage loss, and give you more productive sand.

IT'S THE SPIN THAT DOES THE JOB!
FOUNDRY SAND
AIR-RECLAIM
RECLAMATION EQUIPMENT
"Reclamation is our business .. NOT A SIDE LINE!"

MEMBER FEMA

HYDRO-BLAST 10265 FRANKLIN AVE. FRANKLIN PARK, ILL. Franklin Park Phone GLadstone 5-3212 Chicago Phone NAtional 2-5770

CIRCLE NO. 211, PAGE 13-14

material. Meters, desiccators, ovens and accessories are listed. *Harry W. Dietert Co.*

CIRCLE NO. 106, PAGE 13-14

Foundry resins from a water-dispersing phenol-formaldehyde binder to a synthetic core binder are thoroughly specified in a series of 8 technical bulletins, numbered F-1 through F-8. Each covers one resin. *Reichhold Chemicals, Inc.*

CIRCLE NO. 107, PAGE 13-14

Cherry flasks are featured in 2-page sheet, with 15 allied products described as well. "Adams Cherry Easy Off Flask" has malleable trimmings for long life and easy operation. *Adams Co.*

CIRCLE NO. 108, PAGE 13-14

Pattern compound in powder form is described in pull-out brochure. "Super Tamastone" mixes with water to form a moisture proof solid that maintains true parting lines, is very smooth, and does not deteriorate. *Foundry Div., Tamms Silica Co.*

CIRCLE NO. 109, PAGE 13-14

Shell molding sand that reportedly gives stronger shells and better castings is presented in 4-page brochure, "Why You Can Make Better Castings With Shell-Molding Penn-Sand." *Pennsylvania Glass Sand Corp.*

CIRCLE NO. 110, PAGE 13-14

Electric traveling crane handbook is packed full of practical data. Seventeen sections cover terminology and classification, speeds, overhead clearances, design, safety features, etc. Distribution is limited to qualified engineers, others directly interested in crane specs. *Whiting Corp.*

CIRCLE NO. 111, PAGE 13-14

Strainer cores and breaker cores are specified in 4-page catalog. Full technical details on size, shape, and metal delivery are given along with descriptions of features and uses. *Louthan Mfg. Co.*

CIRCLE NO. 112, PAGE 13-14

Exhaust hood booklet contains engineering details for specific foundry practices: shakeout, melting furnaces, grinding and abrasive sawing, swing frame grinders, abrasive cleaning and tumbling, sand handling and conditioning. Bulletin 270-E2. *American Air Filter Co., Inc.*

CIRCLE NO. 113, PAGE 13-14

Foundry equipment of all descriptions covers the 70 big pages of Catalog 845. Photos, cutaway drawings, text cover product range from aerators through valves for hoppers, with plenty of stops in between. *Jeffrey Mfg. Co.*

CIRCLE NO. 114, PAGE 13-14

Material handling principles and equipment are explained in series of three bulletins: Standard Specifications, Special Engineering, Standard

Accessories. Good background data as well as specific information. *Towmotor Corp.*

CIRCLE NO. 115, PAGE 13-14

Hydraulic transmission has infinitely variable speed from 0 to 1500 rpm without gearing, reports Catalog Section T-100-A. This 8-page brochure contains performance charts, cutaway drawings, and applications. *Gerotor May Corp.*

CIRCLE NO. 116, PAGE 13-14

Non-destructive testing is covered in 8-page brochure, "Lower Manufacturing Costs." Lab inspection facilities to supplement your own testing is described. *Magnaflux Corp.*

CIRCLE NO. 117, PAGE 13-14

Price list, 32 pages long, contains the analyses, available sizes, and prices for over 50 different ferro-alloys and metals. Much other relevant data in "Electromet 1956 Price List." *Electro Metallurgical Co., Union Carbide & Carbon Corp.*

CIRCLE NO. 118, PAGE 13-14

Exhaust systems for various foundry functions are covered in "Getting the Most from Crucible Melting", No. 6. Pamphlet contains a great deal of valuable information as well as specific details. *Crucible Manufacturers' Assn.*

CIRCLE NO. 119, PAGE 13-14

Die casting booklet gives a full explanation of the specialized techniques of small parts, high-speed die casting. Complete detailed information is also furnished on installations,

service, and maintenance in this highly useful booklet, "Diecasting Small Parts." *DCMT Sales Corp.*

CIRCLE NO. 120, PAGE 13-14

Special alloys presented in March issue of "Better Castings" include pattern aluminum, boron aluminum, silicon copper, tellurium copper, and Monel. *Continental Copper & Steel Industries, Inc.*

CIRCLE NO. 121, PAGE 13-14

Absorptiometer is described in 4-page pamphlet in pretty technical but clear language. Principle, accuracy, adaptability and versatility of this top-notch instrument are stressed. Bulletin CJ8 also presents a fluorimeter. *Jarrell Ash Co.*

CIRCLE NO. 122, PAGE 13-14

Electric buckets built in capacities to 4 cu yd are designed specifically for foundry, steel mill and ore operations. They're detailed in 30-page "More Work Faster With Strayer Electric Hook-On Buckets." *Erie Strayer Co.*

CIRCLE NO. 123, PAGE 13-14

Fume control for foundry cupolas is pinpointed by case history. Bulletin 352 presents a system used in Los Angeles, where they're tough on air pollution. *Wheelabrator Corp.*

CIRCLE NO. 124, PAGE 13-14

Core binder is detailed in Technical Bulletin F-2. Information on this water-soluble urea-formaldehyde resin includes advantages, stability, shipping data, storage, and formulations. *Reichhold Chemicals, Inc.*

CIRCLE NO. 125, PAGE 13-14

Sand cleaner is specified in 2-page sheet "Scrap Control." Unit consists of hopper, shakeout, conveyor with magnetic pulley. It delivers clean sand for further conditioning. *Royer Foundry & Machine Co.*

CIRCLE NO. 126, PAGE 13-14

Pig iron. Institutional brochure describes the activities and growth of America's largest producer of merchant pig iron. *Interlake Iron Corp.*

CIRCLE NO. 127, PAGE 13-14

Everything the company makes is crammed into 50-page Condensed Catalog 5510. Illustrations supplement data. *Syntron Co.*

CIRCLE NO. 128, PAGE 13-14

Crawler tractors for industry are lauded in 12-page booklet which compares performance of leading makes. Five new gasoline and three diesel-

← *Low operating cost*—Cores made with RCI's FOUNDREZ 7600 resin binder are baked *fast and economically* in this dielectric oven. The cost per ton of labor, materials and fuel is low . . . production rate high.

High core quality — RCI's FOUNDREZ 7600 resin binder permits efficient combinations of sand-cereal-resin and water for cores with low breakage and superior uniformity. Core drier plates are made with RCI FOUNDREZ 7500 . . . a powdered phenolic shell molding resin. ↓

faster core production

other advantages too, with

FOUNDREZ 7600

RCI's liquid water soluble urea-formaldehyde core binder

● FOUNDREZ 7600 core binder and the dielectric oven shown here do a great job together. They cut baking cycles from hours to minutes! But you don't need to operate with a dielectric to benefit from using RCI's FOUNDREZ 7600 resin. With a conventional core oven you can also speed production dramatically!

You can get more cores through a drier with a given heat input; or, if you prefer, *save fuel* by drying the same number of cores with a lower heat input.

FOUNDREZ 7600 also permits flexibility in core formulation . . . makes it easy to vary such properties as green strength, collapsibility, permeability and hardness. You get the best core for each metal — copper, brass, bronze, aluminum, magnesium, gray iron, cast iron or steel alloys.

Reichhold can deliver this liquid resin to you in tank car or tank truck lots (or, at higher price, in non-returnable 55-gal. drums).

Write to RCI for *Technical Bulletin F-2* which gives the many mix variations obtainable with FOUNDREZ 7600 core binder.

Creative Chemistry . . .
Your Partner in Progress

RCI

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sodium Sulfite • Pentaerythritol • Pentachlorophenol

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

CIRCLE NO. 212, PAGE 13-14

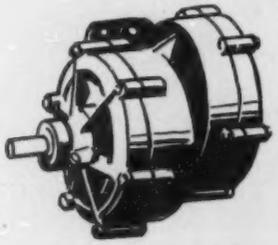
What you should know about AJAX®

LO-VEYORS

and how they CONVEY-SCREEN-SCALP-COOL-WASH AND DRY BULK MATERIALS

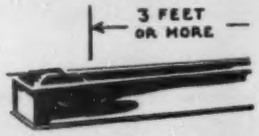
DRIVE

The Ajax-Shaler Shaker imparts a straight line reciprocating force to a suspended or otherwise freely supported body such as a conveying pan or tube, screen, feeder, packer, or any mass which must be vibrated or shaken as part of its function. Reciprocating force is in automatic balance. Anchorage and reinforcing problems are reduced to a minimum. Performance has been proved on thousands of installations on a wide range of equipment for many years.



Drive unit is sealed in oiltight case. No exposed bearings subject to damage under abrasive conditions. Long life and low maintenance cost assured.
Two enclosed revolving weights and the anti-friction bearings which support them are the only rotating parts. All idler rollers, head and tail pulleys are eliminated.

FOR SHORT OR LONG CARRIES



Ajax Lo-Veyors are made in lengths from 3 ft. up. They can be used for short "feeder" runs and for long carries with two or more units in series.

LOW HEAD ROOM

Space is saved and installation under floor or overhead is made easy by low height averaging less than 14" except where shaker is mounted.

Foundrymen throughout America are turning to Ajax Lo-Veyors for low-cost handling. Whether you are operating a large or small, custom or captive foundry, Ajax Lo-Veyors will cut your non-productive sand handling costs. You will find it good business to have the money-saving facts on how Ajax Lo-Veyors are being welcomed by cost-conscious foundrymen everywhere. Write for Bulletin 39.

AJAX FLEXIBLE COUPLING CO. INC.

REPRESENTATIVES IN PRINCIPAL CITIES

WESTFIELD, N. Y.

See Ajax Lo-Veyors IN ACTION at the FOUNDRY SHOW

CIRCLE NO. 213, PAGE 13-14

powered tractors are introduced as well. "The Crawler—Backbone of Construction." *American Tractor Corp.*
CIRCLE NO. 129, PAGE 13-14

Insulating castables share the space with three allied insulating products in one-page Bulletin 220. Thermal conductivity graphs and photos show the products in action. Plenty of technical data is included in specification tables. *J. H. France Refractories Co.*
CIRCLE NO. 130, PAGE 13-14

Core binders are detailed in three data sheets, 398, 392, and 331. These binders are in the company's Hy-Ten series. *E. F. Houghton & Co.*
CIRCLE NO. 131, PAGE 13-14

Shell molding manual gives the latest data on the subject. It's a practical handbook for the production of shell molds and castings, offering all the fundamental steps, production data, application studies, and test methods. *General Electric Co.*
CIRCLE NO. 132, PAGE 13-14

Class III fans for high velocity air conditioning systems are ideally suited for industrial use. Details on capacity, construction, and features are given in Bulletin DS-348-C. *Trane Co.*
CIRCLE NO. 133, PAGE 13-14

Aluminum casting alloys are specified and trade names given in revised Specification Data Sheets. Revision was necessitated by new standard BS.1490. *Alar Ltd.*
CIRCLE NO. 134, PAGE 13-14

Mercury vapor lights improve industrial seeing and working conditions, 12-page booklet "Better Industrial Lighting With Mercury Vapor" points out. Ten photos show typical installations. *Sylvania Electric Products, Inc.*
CIRCLE NO. 135, PAGE 13-14

Surface conditioner for core and mold sand is well presented in 6-page "Paraspray" data sheets. The sheets give latest data on function and use of the material. *Foundry Rubber, Inc.*
CIRCLE NO. 136, PAGE 13-14

Air-drying spray for green sand cores and molds is the subject of Bulletin TB-1. It's written from actual users' experience. *United Oil Mfg. Co.*
CIRCLE NO. 137, PAGE 13-14

Vinyl plastic paint gives a tough, elastic coating that resists water, fumes, drying action, and temperature varia-

CIRCLE NO. 214, PAGE 13-14

See STERLING at Atlantic City

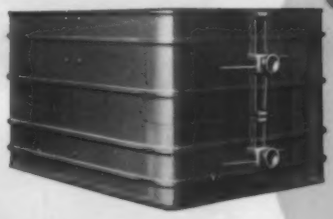
STOP AT STERLING Booth 1911

Come to the 60th AFS Castings Congress and Show May 3 to 9 at Atlantic City. A warm welcome awaits you in this hospitable and interesting convention city. You will be delighted with the variety and quality of the AFS exhibits where you will see and learn about the very latest in foundry progress. You will find the Sterling booth of special interest, with a complete display of the foundry flasks and equipment which have won world-wide leadership. The AFS Show . . . and STERLING . . . have much to show you this year. Come to Atlantic City in May! Meanwhile, for flasks and other foundry equipment that speed up production and save you money, see your nearby Sterling representative, or write us direct.

Style "AD" with Double Pin Lugs

Style "E"
with Pin Lugs and Handles Combined

Sterling

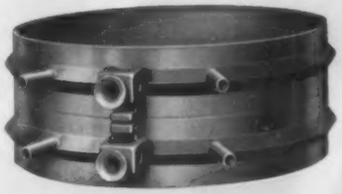


Style "⅜ND-RT Cope"
Style "⅜NS-RT Drag" } Heavy Duty Flask

Style "H" with Pin Lugs Welded on Sides

Style "GSX"
with Single Pin Lugs and Two-Man Lift Handles

Style "LS"
with Angle Reinforcement and Two-Man Lift Handles



Style "BLST"
with Trunnions and Two-Man Lift Handles

Style "AD" Flask Sections Stacked One Above Another
for Multiple Molding

Style "⅜ND-RTX Cope" — Style "⅜NS-RT Drag"
with Heavy Duty Clamps

STERLING WHEELBARROW CO., Milwaukee 14, Wis., U. S. A.

Branches: Boston • Buffalo • Chicago • Cleveland • Detroit • Palo Alto • New York • Philadelphia • St. Louis

Subsidiary Company: STERLING FOUNDRY SPECIALTIES, Ltd., London, Bedford and Jarrow-on-Tyne, England

STANDARDIZE on STERLING

for FASTER PRODUCTION *at Less Cost*

"Built to take it!" That best describes every unit in the Sterling line. It has made Sterling a by-word for economy and efficiency throughout the entire foundry industry. When you specify Sterling . . . whether for flasks, trucks, wheelbarrows or other foundry equipment . . . you can *depend* on this rugged high quality, accuracy and ease of handling . . . day in and day out, for years. For faster casting production, at less cost . . . *standardize* on Sterling! See your nearest Sterling representative or write us direct.

No. DF4-S Heavy Duty Wheelbarrow

No. 47 Casting Cart

No. 50 Slag Buggy

No. 110 Core Truck

No. D4W Wheelbarrow for sand and other dry materials

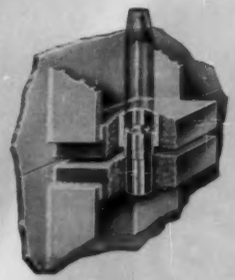
No. 160 Heavy Duty Casting Truck

Heavy Duty Cart with "3-Point Landing"

Standard Type "S" Flask Pin

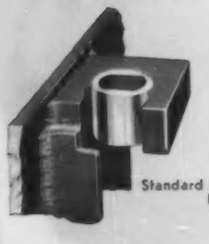
Sterling Flask Clamp

No. 630-S Cart with Steel Wheels



Stub Pin Shift-proof

Style X Core Plate



Standard Hardening Steel Bushing

STERLING WHEELBARROW CO., Milwaukee 14, Wis., U. S. A.

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tions. Other bonuses: sprays, brushes, or rolls on; washes clean; 8 colors; non-toxic, practically odorless. Four-page "Seal-Kote" bulletin tells all about it. *Wooster Sealkote Co.*

CIRCLE NO. 138, PAGE 13-14

Vertical centrifugal casting machines are pictured, specified and described in 4-page Bulletin 156. Six sizes take mold diameters from 24 to 84" with maximum weights from 500 to 10,000 lbs. *Centrifugal Casting Machine Co.*

CIRCLE NO. 139, PAGE 13-14

Special panels to install in storage bins prevent arching or funneling by a throbbing action. Air-powered, they'll feed anything, the manufacturer flatly states. "Pneubin" catalog contains full details. *Geroter May Corp.*

CIRCLE NO. 140, PAGE 13-14

Fluid power, what it is, where it is used, and what it can do are neatly explained in "How Fluid Power Serves Industry and You," a 20-page digest-size booklet. *Miller Fluid Power Co.*

CIRCLE NO. 141, PAGE 13-14

Lab instruments and related equipment are detailed in the 16-page March issue of *Lab-ORATORY*. Included are balances, pumps, ovens, carts, chairs, ladders, mixers. *Schaar & Co.*

CIRCLE NO. 142, PAGE 13-14

Heavy-duty flooring is the "hero" of sound-color film titled "Emeri-Crete". It's a 16-mm job and runs 25 minutes —enough time to show mining the raw materials through manufacture, testing, and installation. *Walter Maguire Co.*

CIRCLE NO. 143, PAGE 13-14

Conveyor belts made of stitched canvas are described and specified in new illustrated catalog. Recommendations are included in special section on each different belt in the line. *Main Belting Co.*

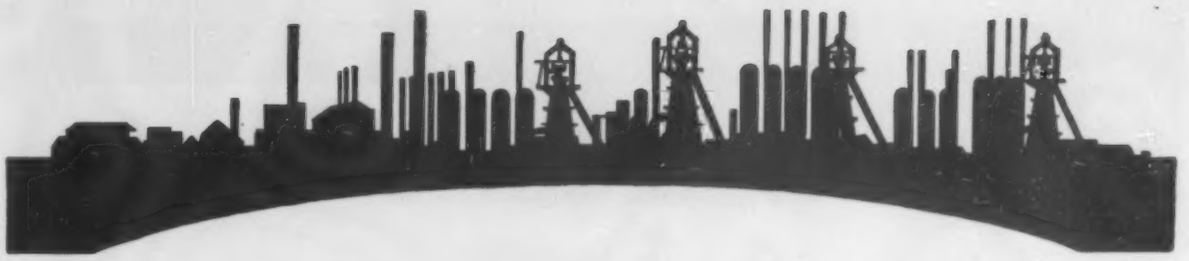
CIRCLE NO. 144, PAGE 13-14

All-purpose lubricant presented in "Primaleen" brochure has one almost unbelievable quality—it can be applied up to 90 times less frequently than ordinary greases! It's thixotropic, that's why. *ProtectoLube Co.*

CIRCLE NO. 145, PAGE 13-14

Magnetic conveyors offer new possibilities for completely automatic handling of ferrous items, Bulletin MC-250 reports. For example, they will lift ferrous parts up inclines as steep

CIRCLE NO. 215, PAGE 13-14



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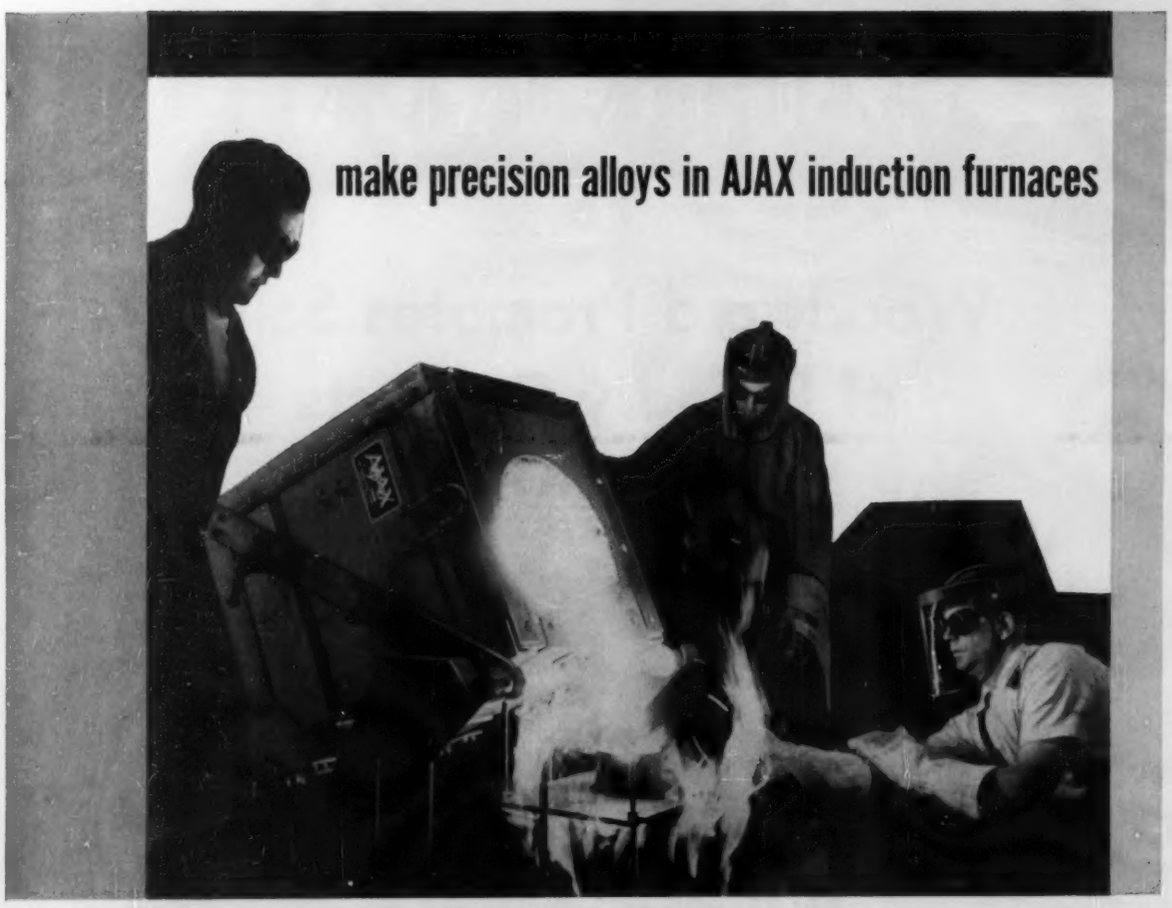
CIRCLE NO. 215, PAGE 13-14

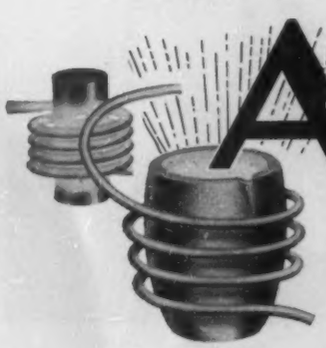


At the Edmore, Michigan, foundry of General Electric's Carboloy Department, all the critical Alnico series of alloys are made in AJAX-NORTHRUP induction furnaces. And you'll find the same choice of equipment wherever precision alloys enter the industrial picture. For the inherent advantages of AJAX induction melting are a perfect match for the uniformity, accuracy, and control required in precision alloying . . . whether ferrous or non-ferrous.

Electromagnetic fields in AJAX-NORTHRUP induction furnaces effectively "stir" the molten metal. Even those elements representing fractions of one per cent of the charge are uniformly distributed throughout the melt. And melting is so fast and clean that you're sure to get out of every melt exactly what you've put into it, subject, of course, to the normal slag problems inherent in the material being melted. There's no chance of contamination, and scrap is almost 100% recoverable. Temperature presents no problem, for both it and melting speed are easily controlled by varying power to the furnace.

For forty years AJAX-NORTHRUP induction heating systems have saved money and improved product quality in every type of installation, ferrous or non-ferrous. Any wonder industry continues to choose AJAX equipment for precision alloying? For details, write Ajax Electrothermic Corporation, Trenton 5, New Jersey.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

CIRCLE NO. 216, PAGE 13-14

as 90°. Included are pictures, application diagrams, specifications. *Homer Mfg. Co.*

CIRCLE NO. 146, PAGE 13-14

Industrial dust control and its application to coal handling operations are clarified in four-page Bulletin 551-D. Four case histories, with pictures and diagrams. *Wheelabrator Corp.*

CIRCLE NO. 147, PAGE 13-14

Degasers and grain refiners described in Leaflet B2 are for aluminum base alloys. Leaflet covers why, what, and how in short, easily understandable form. *Foundry Services, Inc.*

CIRCLE NO. 148, PAGE 13-14

Conversion tables for steel give approximate relationship between Brinell, DPH (Vickers), Rockwell, and Shore Scleroscope values and corresponding tensile strengths. *International Nickel Co., Inc.*

CIRCLE NO. 149, PAGE 13-14

Gearmotors, motogears, and related equipment fill the 28-page Book 2447, complete with full specifications and pictures. All meet new NEMA standards which deliver more power per pound. *Link-Belt Co.*

CIRCLE NO. 150, PAGE 13-14

Silicone release agents discussed in one-page sheet have had exhaustive service testing. One is for routine pattern spraying, the other for curing new patterns. "Shallway Silicone Release Agents." *Shalco Engineering Corp.*

CIRCLE NO. 151, PAGE 13-14

Fork trucks, techniques, and attachments in use at Packard Motor Car's Utica, Michigan plant are shown in Certified Job Study 158. Modern material handling techniques have cut time 30 to 40% in some cases. *Towmotor Corp.*

CIRCLE NO. 152, PAGE 13-14

Pressure controller comes in ranges from 0-50 to 0-200 psi, with on-off or 10% proportional control. Bulletin 7040 gives accuracy, construction details, dimensions for these indicating units. *Minneapolis-Honeywell Regulator Co.*

CIRCLE NO. 153, PAGE 13-14

Volclay bentonite is the subject of one-page data sheet, News Letter No. 44. Eighteen points are brought out covering applications and advantages of this material. *American Colloid Co.*

CIRCLE NO. 154, PAGE 13-14

Unwanted moisture in air lines is the topic of two booklets. "Air, Water and Industry" describes moisture

problems and how to solve them; "Moisture Control" describes the Vi-Speed method of removing moisture from air and gas lines. *Van Products Co.*

CIRCLE NO. 155, PAGE 13-14

Bentonite is given a personality in a short, fact-filled fable. It's called simply "Mike." *American Colloid Co.*

CIRCLE NO. 156, PAGE 13-14

Ductile austenitic iron booklet contains charts, tables of mechanical and physical properties, and data on heat treating, welding, machine, etc. "Engineering Properties of Ductile Ni-Resist Austenitic Iron," 26 pages. *International Nickel Co., Inc.*

CIRCLE NO. 157, PAGE 13-14

Preheating blast air is the specific function of units detailed in 4-page Bulletin FY-174. They're compact units, high in efficiency and flexible in design. *Whiting Corp.*

CIRCLE NO. 158, PAGE 13-14

Welding processes are presented in 16-page "Picture Book of Facts on Eutectic's Welding Processes." Field service is described as well as the advantages of various processes. Case histories lend authority. *Eutectic Welding Alloys Corp.*

CIRCLE NO. 159, PAGE 13-14

Direct reading spectrometer is fully detailed in 8-page Bulletin 44. Center spread carries a schematic drawing of the unit; theory and practice are both covered. *Baird Associates, Inc.*

CIRCLE NO. 160, PAGE 13-14

Scales shown in 4-page illustrated "Speedweigh" bulletin come in three sizes—5,20, and 50 lb max—with wide choice of features and accessories. Speed and accuracy are claimed. *Toledo Scale Co.*

CIRCLE NO. 161, PAGE 13-14

Hydraulic pump for pressures to 200 psi is shown in Form DU-1, gatefold brochure. Table shows pressure vs. flow. *Norman Engineering Co.*

CIRCLE NO. 162, PAGE 13-14

Collectors for controlling electric furnace fumes is the topic of 4-page Bulletin 553-D. Four case histories supplement semi-technical data. *Wheelabrator Corp.*

CIRCLE NO. 163, PAGE 13-14

Tooling resins as well as casting and laminating materials are presented in fold-out data sheet, "Epocast." Con-

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INERTEX • ZINC COVERAL
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CIRCLE NO. 217, PAGE 13-14

tains all the basic information engineers need to select the proper epoxy resin for different jobs. *Furane Plastics, Inc.*

CIRCLE NO. 164, PAGE 13-14

Reversing motor can give more than 200 idle reversals per minute, says Bulletin 1800. Engineering information consists of formulas on inertia and reversal calculations. Cutaway view shows construction. *Louis Allis Co.*

CIRCLE NO. 165, PAGE 13-14

Patents held under the Reecemelt name are described in 8 pages of pix and copy. The booklet summarizes 12 patents, all aimed at helping make better castings. *Herbert A. Reece & Associates.*

CIRCLE NO. 166, PAGE 13-14

Temperature-indicating lacquer is presented in a concise, one-page sheet, "Temperature Rise Problems?" It describes uses, limits, and how to apply this coating which melts markedly at its temperature rating. *Tempil Corp.*

CIRCLE NO. 167, PAGE 13-14

Dust collector catalog is very complete, presenting full line of cabinet cloth filter and cyclone separator type units. Sixteen pages explain why and how, detail each model, show photographs and line drawings. *Torit Mfg. Co.*

CIRCLE NO. 168, PAGE 13-14

Truck maintenance extends beyond the physical setup itself, but no maintenance program works well without a check list. Here's one for electric industrial trucks, giving 50, 250, and 1000-hour services. *Elwell-Parker Electric Co.*

CIRCLE NO. 169, PAGE 13-14

Good non-ferrous melting is emphasized in new brochure, "Do's and Don'ts of Good Melting Practice for Non-Ferrous Foundries". *Campbell-Hausfeld Co.*

CIRCLE NO. 170, PAGE 13-14

Portable recorders for relative humidity and temperature are presented in 6-page, 2-color Bulletin H1008. Samples of typical records are reproduced. *Bristol Co.*

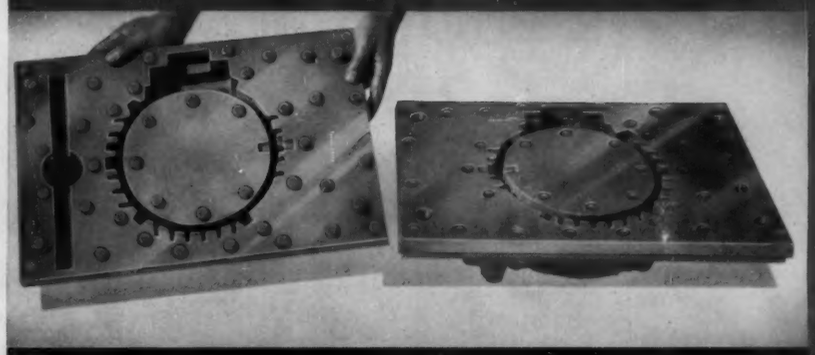
CIRCLE NO. 171, PAGE 13-14

Steel floor armor is the subject of new illustrated brochure showing applications and installation of two types, one flexible and one rigid. Complete detailed specifications are given. *Klemp Metal Grating Corp.*

CIRCLE NO. 172, PAGE 13-14

FOR FASTER CURES . . . SMOOTHER SURFACES . . . BETTER CASTINGS

CATALIN Shell Molding Resin 9616



FOR FAST DELIVERIES . . . *Catalin maintains three strategically located resin plants . . .*

The production advantages of the shell molding process have made a most important impact upon both the large and the small foundry. Its future is assured. New automatic machines and resin binders to keep pace with their speed are well past the laboratory stage.

Catalin Resin 9616, a phenol-formaldehyde, powdered, two-stage resin, has been specifically developed to bond the fine-grained sands used in the Shell Molding process.

This economical resin produces high-speed curing rates with the minimum of resin content. Savings are achieved in time, sand, work space, handling and metal. Castings are more accurate and smoother—require considerably less finishing.

In addition to Shell Molding Resin 9616, Catalin produces a wide range of core binding liquid resins and powders for the production of ferrous and non-ferrous metal castings.

Catalin representatives, familiar with the requirements of the foundry industry, are available for consultation. Samples on request! Write . . .

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CIRCLE NO. 218, PAGE 13-14

Silicic Chemistry New Study for Foundrymen

■ Silicic chemistry is a new science built around sands and clays according to Howard F. Taylor, Massachusetts Institute of Technology, who spoke at the March 27 meeting of the Connecticut Chapter of the American Foundrymen's Society.

Gordon B. Mannweiler reports that Taylor cited several examples indicating that most industries utilizing sands and clays have profitably conducted fundamental studies on the basic structures involved. However, he cited the metal castings industry as an exception. Taylor remarked that a foundry engineer knows far less about the building blocks of his mold—sand and clay—than does an engineer in any other field.

Professor Taylor supported his discussion with demonstrations that showed why a mass of clean, uniform, close-packed sand grains expands when deformed. He explained that the space occupied by voids between tightly-packed sand grains amounts to about 26 per cent by volume of the mass. These voids may be filled with air, water, clay, resin or any other material. If the mass is close-packed, as it would be after vibrating or jolting, and there is only sufficient intergrannular material to just fill the voids, the mass will resist deformation and will remain rigid. However, once an excess of intergranular material is available to create the larger void space required to allow deformation, the grains will be free to flow.

Taylor states that because of friction between flask or pattern side walls and between the grains themselves, it is impossible to pack clean sand grains uniformly by pressure, regardless of the force applied. Furthermore, the sand particles will not flow sidewards, or at right angles to the direction of the force. Taylor remarked at vibrating methods need further exploitation.

Sideward movement of the sand mix is possible if the grains are heavily coated with some material that will deform plastically under pressure, however this will expose low-refractory void material to contact with molten metal, he stated.

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Calcium . . Calcium-Silicon, Calcium-Manganese-Silicon, and Calcium Metal.

Chromium . . "Simplex" Low-Carbon Ferrochrome (as low as 0.010% maximum Carbon), Low-Carbon Ferrochrome (from 0.02% to 2.00% maximum Carbon), Nitrogen-Bearing Low-Carbon Ferrochrome, High-Carbon Ferrochrome, Exothermic Ferrochrome, Exothermic Silicon-Chrome, "EM" Ferrochrome-Silicon, "EM" Ferrosilicon-Chrome, "SM" Ferrochrome, Foundry Ferrochrome, Foundry Ferrosilicon-Chrome, Electrolytic Chromium Metal, and other Chromium Alloys.

Columbium . . Ferrocolumbium and Ferrotantalum-Columbium.

Manganese . . Standard Ferromanganese, Low- and Medium-Carbon Ferromanganese, Low-Iron Ferromanganese, "Mansiloy" Alloy, Electrolytic Manganese Metal, and other Manganese Alloys.

Silicomanganese . . In maximum 1.50%, 2.00%, and 3.00% carbon grades.

Silicon . . Ferrosilicon in all grades, including both regular and low-aluminum material, Silicon Metal, "SMZ" Alloy, Magnesium Ferrosilicon, and other Silicon Alloys.

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Tungsten . . Ferrotungsten, Tungsten Powder, Calcium Tungstate, and Calcium Tungstate Nuggets.

Vanadium . . Ferrovanadium in all grades, Aluminum-Vanadium, Vanadium Oxide (Fused), Sodium Polyvanadate (Red Cake), and Ammonium Metavanadate.

Zirconium . . 12 to 15% and 35 to 40% Zirconium Alloys, and Nickel-Zirconium.

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CIRCLE NO. 219, PAGE 13-14

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CIRCLE NO. 247, PAGE 13-14

GIFA: International Trade Fair

■ GIFA is an international term for the forthcoming International Foundry Trade Fair which will take place in Dusseldorf, Germany, September 1-9, in conjunction with the International Foundry Congress. The word "GIFA" has been fabricated from the German words for foundry and trade fair.

The Congress is an activity of the International Committee of Foundry Technical Associations, a committee of representatives from the technical organizations of the metal castings industries of 15 nations.

About 30 technical addresses will be presented during the congress. One of the addresses will be an official exchange paper from the American Foundrymen's Society to be delivered by Harry W. Dietert, the vice-presidential nominee of AFS. All talks will be translated simultaneously into German, French and English.

During the technical sessions, visitors will have an opportunity to visit more than 40 important plants producing iron, steel, malleable and non-ferrous castings. These visits will take place during half and full day excursions starting from Dusseldorf.

The International Foundry Trade Fair, which will run in Dusseldorf during the Congress, is planned as an exhibit of the important foundry machinery manufacturers from Europe, the U.S. and other areas. Manufacturers Austria, Belgium, France, Holland, Italy, Luxembourg and Spain will exhibit in their own national pavilions.

The Fair will be divided into three main groups: products of the foundry industry, foundry machinery and equipment, and foundry raw and auxiliary materials.

At the conclusion of the Congress, at week's tour of southern Germany has been planned. This tour will include Frankfurt, Mannheim, Stuttgart, Konstanz and Munchen. Historic and scenic points of interest as well as selected foundries will be included in the tour.

Shortly after the conclusion of the Congress and Fair, the Institute of Metals will hold its 1956 Autumn Meeting in Stuttgart. The September 17-23 meetings of this British group will include a joint meeting with the Deutsche Gesellschaft fur Metallkunde.

Historic Dusseldorf: site of GIFA and the international congress

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CIRCLE NO. 247, PAGE 13-14

Gas Turbine, When?

How far away is the gas turbine engine from general automotive use?

Not even the automobile manufacturers, probably, have a certain knowledge about that, but the subject has intense interest for foundrymen, not only because of the revolutionary change in automotive markets gas turbines would bring about, but because of the new processes that would have to be introduced into many foundries.

All the major automobile companies are known to be doing extensive gas turbine research. Their progress was recently emphasized by the widely publicized cross-country tour of a Plymouth powered by a gas turbine. Fuel consumption on this trip was claimed to be well within economic range.

The basic problem is still one which plagues jet engine builders for the aircraft industry—the heat resistance of many precision engine parts such as turbine wheels and blades.

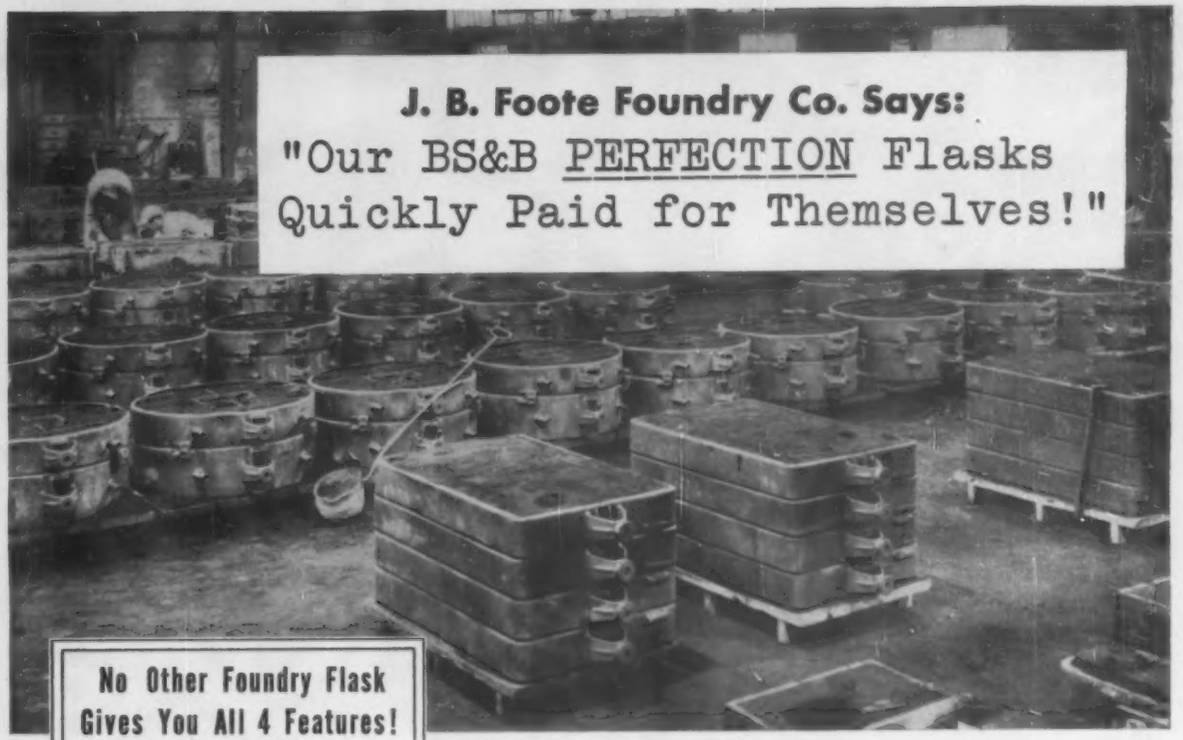
Less costly and non-strategic materials are sought, but the answer may lie in more efficient cooling of the blades. *The Iron Age* recently reported that if the gas turbine cannot prove itself within the next 10 years the automobile industry will turn to some other source of power.

Metal Makers Will Meet

Members of the Electric Metal Makers Guild, Inc., will hold their 24th annual meeting June 7-9 at the Onesta Hotel, Canton, Ohio. The Guild is an organization formed to promote progress in the development, manufacture and use of metals produced or treated in electric furnaces.

Presiding officers of the Guild are: C. B. Williams, Massillon Steel Castings Co., Massillon, Ohio, *president;* J. R. Atkinson, Dominion Foundries & Steel Ltd., Hamilton, Ont., *vice-president;* and A. C. Ogan, U. S. Steel Corp., Duquesne, Pa., *secretary-treasurer.*

Most Guild members are superintendents of melting operations. The organization was founded in 1932.



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1. Continuous welding of bearing strips — inside and out.
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3. Cast steel pinlugs and clamplugs.
4. Elimination of corner stresses.

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Designed By Foundrymen For Foundrymen!

PERFECTION'S PERFECT FIT AT PARTING ELIMINATES ALL LOSS FROM RUN-OUTS!

In 1951 a small grey iron foundry in Fredericktown, Ohio, set out on a complete expansion and modernization program. Today, that foundry is a modern, completely integrated unit using the latest and best in foundry equipment . . . including BS&B "PERFECTION" Foundry Flasks.

We refer, of course, to the J. B. Foote Foundry Co. which, in addition to manufacturing their own UTILITY MIXER, also does general jobbing business in light grey iron castings for other firms.

Both Mr. Jack Fearn, Vice President, and Mr. Russell Ryan, Foundry Supt., are enthusiastic about the results they're getting from their "PERFECTION" flasks. They like the way these flasks are ruggedly constructed to *eliminate corner stresses,* thereby preventing the corners from cracking and breaking out. They like the perfect fit of "PERFECTION" flasks at parting, which eliminates loss from run-outs. They'll tell you that their "PERFECTION" flasks have more than paid for themselves in a short time, and that they have now standardized *exclusively* on BS&B "PERFECTION"!

If you'd like more information on how "PERFECTION" Foundry Flasks can help you get better castings at lower cost, we'll gladly send it without obligation. Address your inquiry to . . .

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CIRCLE NO. 221, PAGE 13-14

NEW SHELL MACHINE

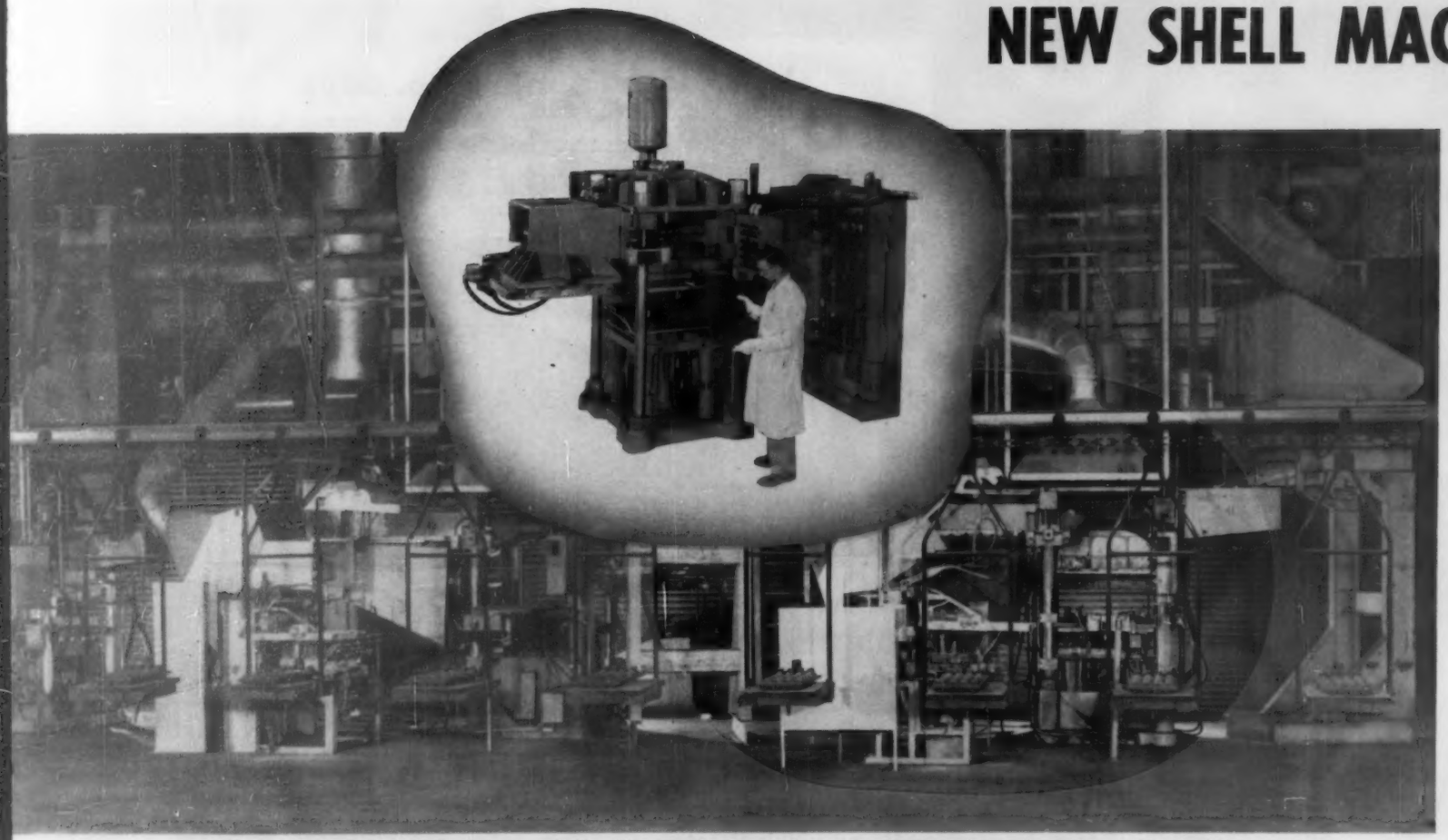


Fig. 1 . . Installation of blow-hot press shell molding machine in production line at Central Foundry Division of General Motors Corp.

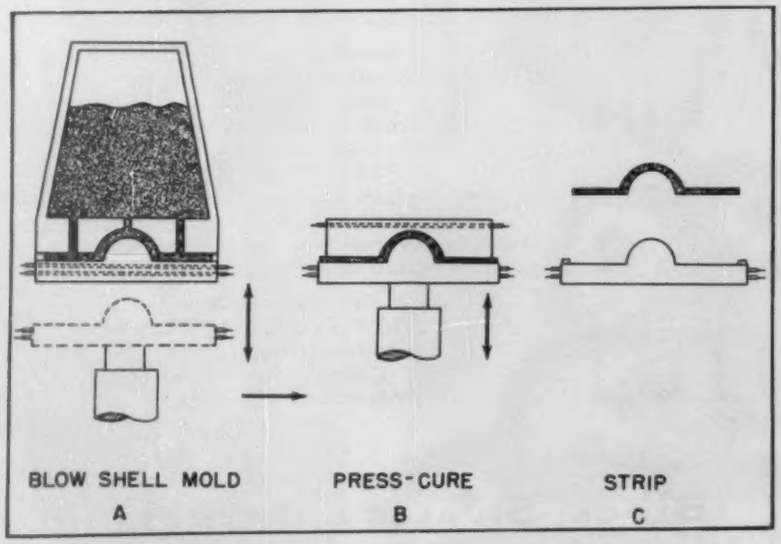


Fig. 2 . . Schematic drawing showing essential operations of BHP machine.

■ The shell molding concept has considerably accelerated the evaluation of the foundry from a craftsman's workshop to a highly mechanized production facility. A new type of shell molding machine which promises to hasten the trend has been invented, designed, built, and placed in production through the cooperative effort of the Central Foundry division and the research staff of General Motors Corp.

The new molding method – the blow-hot press shell molding process – employs blowing techniques for making large, uniformly contoured shell molds and a hot press process for curing them.

The machine was developed to produce more shell molds per pattern equipment per hour than previously available machines. It has been used in production to make camshafts and rocker arms, and experimentally has produced satisfactory shells for automotive crankshafts and fractional horsepower motor end frames.

The general operation of the blow-hot press (BHP) machine is shown schematically in Fig. 2. The operation consists of five steps:

1. The heated pattern is placed below a blow-head with a pattern-matching contour Fig. 2A.

2. A resin-sand mixture is blown into the cavity between the pattern and blow-head.

3. The pattern is retracted, and with an adhering sand resin mix is moved into contact with a heated contour head (Fig. 2B), where pressure is applied to facilitate curing.

4. After curing the pattern and shell are retracted from the press-head and the shell mold is stripped

CUTS RESIN COSTS

General Motors Corp. blow-hot press technique makes thinner, stronger shells . . . makes them faster . . . reduces casting warpage

R. S. AMALA / *Supv., Met. Eng.*

R. F. THOMSON / *Head, Met. Eng. Research Staff*

J. H. SMITH / *General Manager Central Foundry Div.*

A. L. BOEGEHOLD / *Asst. to Vice-Pres. Research Staff*

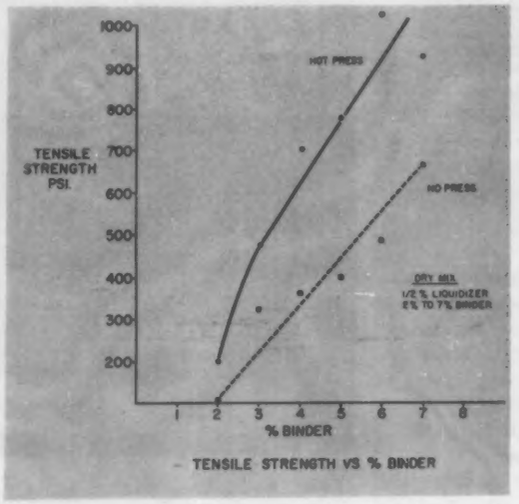


Fig. 3 . . How resin content effects tensile.

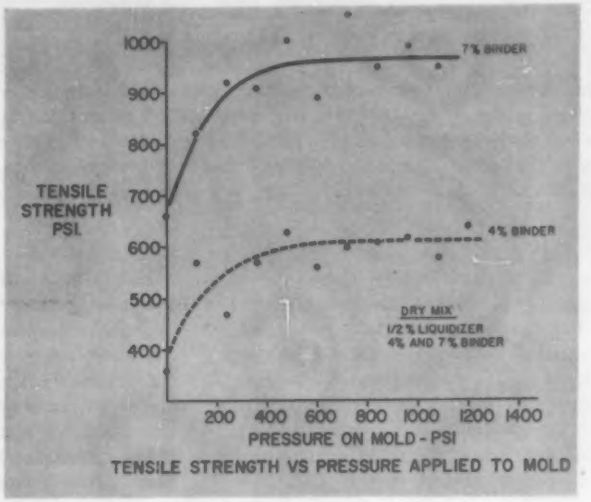


Fig. 4 . . Tensile strength levels as pressure rises.

from the pattern (Fig. 2C).

5. The pattern is returned to the blow station for a repetition of the cycle.

▪ **Molding mixes.** Important to the succesful operation of the BHP shell molding machine has been the development of a shell molding mix compatible with blowing and press-curing. Increased tensile strength was used as an early criterion for bench testing. The effects of resin content and pressure are shown in Figs. 3 and 4.

Resin coated sands, properly adjusted to provide green strength, have performed most successfully in blowing and press-curing. Shells have been made at the rate of 120 per hour. Thermal shock problems, however, have delayed their acceptance as a BHP shell molding material. Thermal shock which is characterized by mold cracking on pouring is believed related to differential expansion of hot and cold sections of the mold as it is being poured.

Factors which govern thermal shock are the expansion coefficient of the sand particles, bonding film thickness, points of contact where bonding exists, degree of cure of the resin, and the geometry of the mold cavity. Additions of cushioning agents such as wood flour, expanded volcanic ash and other fibrous or cellular materials to shell mixtures have had little effect on the reduction of mold cracking due to expansion. Resin plasticizers in shell mixtures have reduced thermal shock cracking.

This problem of thermal shock cracking causes most difficulty in molds for long castings, where thermal expansion is additive over a considerable length of shell mold, such as in camshaft molds.

It was soon determined that an intimate mix of sand, resin, and other ingredients possessed superior thermal shock resistance over coated sand mixes, and a formulation was finally developed which is satisfactory for automotive camshafts made by this process using bank and lake sand with sufficient resin to provide desired strength for a given casting.

In appearance this formulation, properly prepared, may be classified as being of a semi-coated type. In addition to bonding and providing essential curing qualities, this mix also served to provide green strength and blowability. Green strength in the mix is required to prevent blow tubes or holes from emptying or flowing free after each blow and, more important, to provide mechanical strength to the mix to permit it to be blown on vertical pattern details without sagging or falling after the pattern with partially cured sand resin mix has been withdrawn. Catalysts are used in the mix to accelerate the rate of cure of the resin.

Dry type shell mixes can be adjusted with addition agents to make them blowable, but cure times by the BHP process have been prohibitively long.

▪ **Construction and operation.** The final design and construction of the machine is shown in Fig. 5.

▪ **Blow and press-heads.** The aluminum blow and press-heads were cast in dry sand molds faced with zircon sands. Separate sets of patterns were required to cast the blow and press-heads to compensate for the expansion of the press-head on heating to operating temperatures. No machining of the contours was necessary except for polishing.

One-half inch blow holes were drilled into the blow-heads and counterbored in the back to reduce friction losses on blowing. A ratio of slightly less than one blow hole to one vent was used for a total of 50 blow holes and 60 vents per head. Blow holes are located in positions away from pattern details to avoid erosion by the shell mix. Examination of production patterns after over 100,000 blows have shown little or no wear on stool areas under blow holes.

Illustrated in Fig. 6 is a sectional view of the blow-head, blow plate, and magazine assemblies.

▪ **Pattern plates.** Four-on gates of camshafts are mounted on 1¼ in.

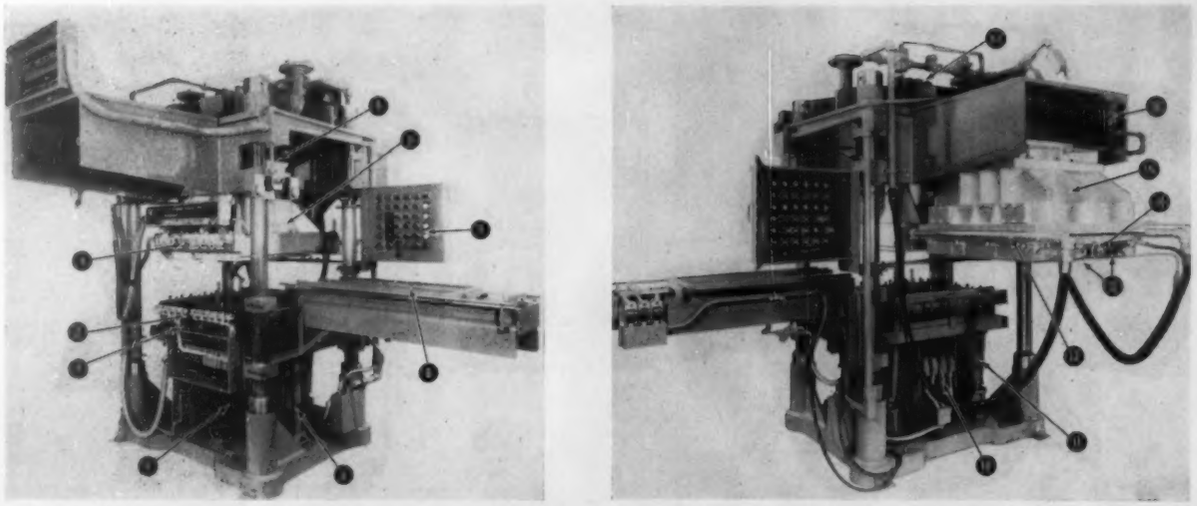


Fig. 5 . . (1) press head and press-head heater plate, (2) pattern heater plate, (3) stripper plate, (4) hydraulic elevating and pressing cylinder, (5) auxiliary elevating cylinder, (6) mold carry out, (7) control panel, (8) press head holder, (9) press head carriage, (10) pattern table limit switches, (11) pattern table guide posts, (12) vent blow back manifold, (13) blow head (cope and drag), (14) blow head water cooling coils, (15) blow magazine, (16) carriage conveyor cylinder, (17) blow valve. Illustrations show front (left) and side views of blow-hot press machine.

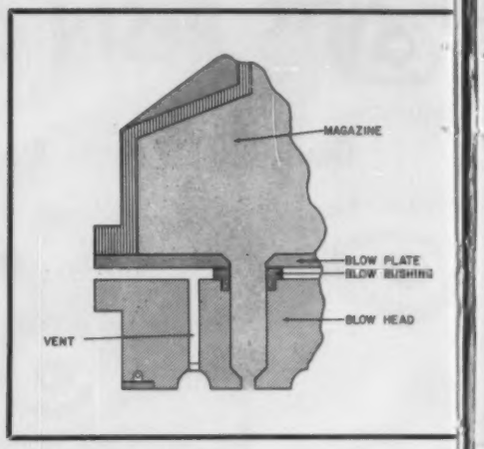


Fig. 6 . . Blow head, magazine.

Fig. 7 . . Press head heating elements in place in sand mold.

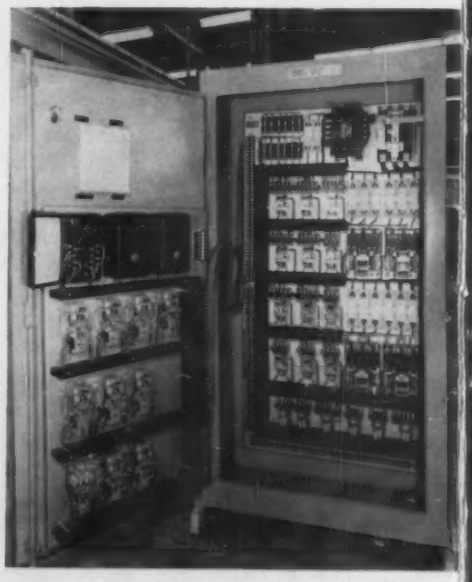


Fig. 8 . . BHP electric console.

thick cast iron stool. The pattern stool is bolted and doweled to the heater platen which is bolted to support rails on each side of the pattern table. Bolt holes in the heater platen are elongated to allow for expansion on heating to operating temperatures. Guide pins between the cope and drag patterns locate the blow and press-heads with the pattern.

A metal frame around each pattern controls the blown shell's thickness and acts as a seal between the blow-head and pattern during blowing. Cartridge heaters located in the sprue are required to maintain set temperatures during production operation. Temperature control is afforded by indicating-controlling pyrometry.

▪ **Pattern and press-head heating.** To provide adequate heat to sustain a designed production capacity of 90 molds per hour, tubular heating elements were cast integrally with the pattern and press-head heater platens. Figure 7 shows a mold for these castings with tubular elements in place. This cast-in construction provides a maximum heat transfer rate at lower element sheath temperatures.

The total rated capacity of the heater platens is over 125 kva. Operating temperatures of 500 to 600 F are maintained by thermal switches mounted in the patterns and press-heads. Insulation and water cooling maintains units adjoining the press-heads and pattern below 170 F. Alternative heating methods is being investigated.

▪ **Hydraulic and air operated units.** All motion in the molding machine is provided by air or hydraulic cylinders whose operations are controlled by auto-timed circuitry. The hydraulic system, used for raising the pattern table for blowing and press-curing, consists of a dual-pressure, air-operated hydraulic booster and a hydraulic cylinder. With this combination, 100 psi oil pressure is available for rapidly raising the pattern table and 3000 psi oil pressure is available for clamping for blowing and for press-curing. Auxiliary air cylinders aid in raising the table to the blow and press-cure position.

Air motivated units are controlled through plumbing circuits consisting of solenoid operated valves, pilot controlled valves, and quick opening and closing valves. Regulating valves control the operating speed of large components such as the blow and press-head assemblies. Magnesium was used in the blow magazine and the press-head mount to minimize inertia effects.

Duration and sequence of operations are controlled at the electrical console located away from the molding machine. Thirteen operations in the molding cycle are time regulated by adjustable timers mounted on the door of the electrical console (Fig. 8).

Proper sequence of operations is governed by mechanical and electrical interlocks located in the electrical console and on the molding machine. Limit switches insure proper positioning of movable units for each succeeding operation.

▪ **Blow valve.** Standard foundry blow valves were used in the construction of the BHP machines. Modifications to the blow valves vent or pressure release valve were made to provide a rapid pressure drop in the blow valve body after blowing. Additional quick opening vents were also placed in the throat and lower sections of the blow magazine. Opening and closing of vents are automatically timed with the blow cycle.

▪ **Cycle mechanics.** The three basic steps of the BHP molding cycle are (1) blow to form the shell mold on the pattern, (2) press-cure with a heated contoured head, and (3) strip to remove shell from the pattern. On the production model all operations of the machine can be cycled manually at the control panel or the entire molding cycle can be set to "automatic" to be repeated after each mold is discharged.

In operation the pattern is elevated to contact and seal the magazine blow assembly. The shell mix is then blown into the space between the contoured blow-head and the pattern plate (500-550 F). After blowing, and the magazine has been vented, the pattern is lowered, the press head, similar in contour to the blow-head, is conveyed on a roller carriage to the press-cure position. The pattern with the uncured shell is raised and pressed (300 psi) against the heated head (500-550 F) for curing.

After curing, the pattern is lowered to an intermediate position where the stripping pins lift the cured shell from the pattern. Mold conveyor bars are then inserted between the pattern and the shell after which the pattern lowers to the start position. The conveyor then removes the mold halves for assembly. Shell mix is automatically fed into the magazine from a hopper during the press-cure cycle.

A typical production cycle is as follows:

Operation	Seconds
Raise pattern for blow	5
Duration of blow	1
Delay for venting	5
Lower pattern	4
Transfer press-head	4
Raise pattern for curing	5
Press-cure	25
Lower pattern for strip	2
Strip	2
Insert carry out	3
Lower pattern to start	2
Remove carry out and molds	3
Return blow-head to start	4
55 molds per hour	65

The time cycle of the various steps can be modified as required to meet production requirements related to the machine. The total cycle may be, on occasion, somewhat more or less than this, as required to produce satisfactory shell molds.

■ **Production experience.** Several of these machines have been built and placed in production. Figure 1 shows one of three of these machines in a production line at Central Foundry Division. The camshaft shell molds are shown in the foreground on the conveyor.

More than 120,000 camshafts were produced on one machine in 1955 (partial year's operation). Two machines have consistently produced between 40 and 50 molds per hour per pattern for sixteen hour operation during the past three months.

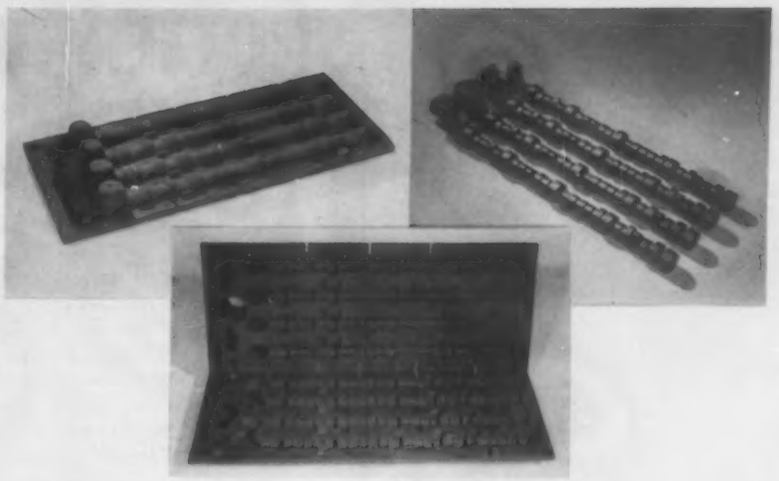


Fig. 9 . . Shell molds and camshaft castings produced on BHP machine.

Figure 9 shows shell molds made in production and a casting from these molds.

■ **Limitations.** Because the process requires auxiliary contoured equipment (blow and press-heads) it has been generally regarded as suitable only to large volume production applications. Some casting or pattern designs may be such that the production of each head may be readily cast or machined without incurring too great additional cost.

Press-curing is most effective on shell molds or pattern designs whose geometry is generally flat or moderately contoured. Since curing is effected by heat conduction through contact, vertical sides receiving less contact pressure would cure at lower rates than high pressure contact positions.

Conclusions

1. A significant production advantage of rapid mold processing has been realized by the application of the BHP principle to the making of automotive camshafts. The shortened cycle has accrued from these two steps:

a. Shell mix blown to form the mold in one to three seconds. Conventional practice requires 12 to 45 seconds for the investment.

b. The "blown" mold is cured by pressing a heated contoured head to contact the mold uniformly. Cure time reduced to 12 to 25 seconds from the conventonal 35 to 75 seconds.

2. Casting dimensional qualities have been improved. Warpage of cast camshafts has been reduced because the molds are uniformly supported on leveling pads during pouring which are blown as an integral part of the drag mold. These pads prevent mold sagging during pouring.

3. Thinner shell molds, resulting in decreased resin costs, are possible because of the uniform thickness of the shells produced by the contoured blow and press-heads.

■ **Acknowledgment.** There are many people in General Motors Corp. to whom much credit is due for the successful development of this machine. Special cognizance should be taken of the work of M. J. Diamond, W. S. Hackett, C. A. Koerner, and F. J. McDonald, all of Central Foundry Division, and H. I. Duryee, C. F. Froberger, D. J. Henry, N. I. Musser, W. E. Nixon, and R. E. Schroeder, of the Research Staff. The authors wish to acknowledge the excellent assistance of Messrs. E. R. Cprek and W. M. Gruszczynski in preparing photographs and charts for this paper.

This article, based on the paper *"The General Motors Blow-Hot Press Automatic Shell Molding Machine,"* will be presented at a Plant & Plant Equipment session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

Install New England As 45th AFS Chapter

■ The New England Chapter of the American Foundrymen's Society—third to join the Society in six months—was installed in Boston April 11.

Known as the New England Foundrymen's Association since its organization in 1895, the group formally petitioned for AFS chapter status following a favorable vote of the NEFA membership. The AFS Board of Directors acted promptly and unanimously in favor of the new chapter on receipt of the petition from the New England group's Executive Committee.

Officers and directors of the New England Chapter are the former officers and members of the Executive Committee of NEFA. They are:

President—Albert M. Nutter, E. L. LeBaron Foundry Co.

Vice-President—Clyde Armstrong, Warren Pipe Co.

Secretary-Treasurer—Thomas I. Curtin, Jr., Waltham Foundry Co.

Directors—C. W. Hutchins, Standard Foundry Co.; Alexander Beck, Whitman Foundry Co., Inc.; William Ohlson, Draper Corp.; Frank Benoit, Brown & Sharpe; William Hale, Springfield Foundry Co.; Romeo Lemoine, Fitchburg Foundry Co.; Warren Murdock, Helantha Corp.; Philip C. Smith, General Electric Co.; Herbert H. Klein, Klein-Farris Co., Inc.; Fred Holway, Mystic Iron Works; Howard B. Nye, Marlborough Foundry Co.; and Charles A. Reed.

Wm. W. Maloney, AFS general manager, made the traditional presentation of the cast iron rattle, symbolic of new chapterhood, to President Nutter.

Installation of the New England group brings the AFS chapter total to 45 industrial chapters and 12 engineering college student chapters. Newest chapters are the Pittsburgh (formerly Pittsburgh Foundrymen's Association), installed January 16, and the Connecticut, installed November 22 following its organization September 20.

Representatives of all 45 chapters will meet together for the first time when AFS holds its 13th annual Chapter Officers' Conference in Chicago June 28 and 29.

ONE ANSWER to the SNOTTER PROBLEM

Snot is a horrid word—but it's worse on the surface of your casting

C. A. SANDERS / *Vice-President*
American Colloid Co.
Chicago

Fig. 1 . . Swirl gates reduce yield but keep castings clean. Photo courtesy Victor E. Ziemer, Maynard Electric Steel Castings Co., Milwaukee, Wis.

■ Many steel foundries use the word *dirt* to define all surface defects. Among these are snotters which, like the others, should be properly identified as an aid to their elimination.

Frequently inspection departments have little knowledge of what this "dirt" actually consists and feel that placing all inclusions under this heading relieves them of further identification. Placing the blame on sand mixtures, the molding department, melting, pouring, ladle maintenance, without understanding the nature of the defect merely defers solution of the basic problem.

Use of "dirt" under these conditions covers a multitude of sins and the word ought to disappear from foundry terminology.

Surface inclusions may be the result of the molding sand cutting and washing. They may be the result of soft rammed molds. They may occur because the bonding clays possess too low fired strength. Careless molding may cause them. Cores may collapse too readily. Sand may be rubbed or broken from the mold and core during core setting or mold closing. Whatever the cause, charge them to it—not to "dirt."

Slag inclusions take their toll but are often placed under the heading of "dirt" which they are not. They may be confused with sand holes or blows if the inclusion is completely removed by cleaning.

Poor ladle practice and poor ladle lining material combined with excessive use of water and poor drying can contribute to surface defects. But expensive ladle linings are not "dirt" and should not be identified as such.

Much repair can be avoided by correct gating with a positive pressure system. It is encouraging that more whirl gates are being used (Fig. 1).

Slag inclusions may be put into several classifications. Many a low melting slag, such as a snotter, differs entirely in chemical composition from a calcium slag. All must be properly identified and not merely called "dirt." Alloy additions can contribute to this defect and must carry their share of the blame. A gating practice that provides for a good trap may be necessary to overcome it.

A poor gating system may contribute to this defect if high metal pressure and turbulence are generated in the mold cavity.

Uncovered open risers encourage surface inclusions.

■ **Elimination of "dirt"** as a foundry term might well begin with color photographs showing so-called dirt defects before and after cleaning. Such photos (Fig. 2) with appropriate identification could be hung over the inspection bench.

■ **What is a snotter?** Associated solely with steel castings, a snotter is a slag inclusion appearing principally on the upper surfaces of castings, most frequently on large flat copes. With smaller castings the condition is more serious than with larger castings.

The snotter has a ceramic composition, consisting principally of silica and alumina but including many complex minerals. It is a low fusing eutectic with a low density. It is quite fluid and on heavy castings is

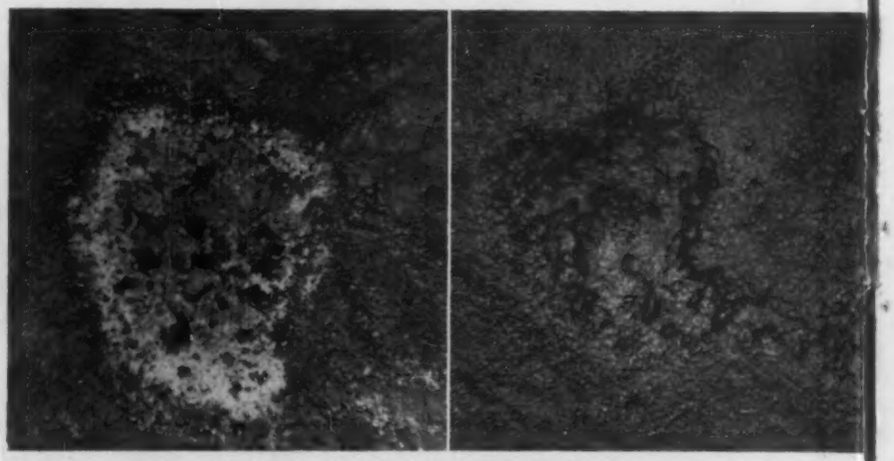


Fig. 2 . . Photos of defect before cleaning (left) and after blasting hung over inspection bench help in proper identification, elimination.

Why Doesn't Somebody Do Something ABOUT SNOTTERS?

■ Answer to the question above is: They are! Snotters are getting attention on three fronts.

1. Steel Round Table Luncheon, Embassy Salon, Ambassador Hotel, Wednesday noon May 9, at the AFS Castings Congress & Show, Atlantic City, N.J. Panel Discussion: **"What's New with Snotters,"** with C. A. Sanders, American Colloid Co., Chicago, H. H. Blosjo, Minneapolis Electric Steel Castings Co., and J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind.

2. Sand Session, Room 9, Convention Hall, 9:00 am, Wednesday May 9, AFS Castings Congress & Show. **"Casting Finish, Precision, and Tolerance,"** C. A. Sanders.

3. Cause and cure of snotters—common casting defect responsible for a high percentage of welding repair cost in steel foundries—is the next problem to be tackled by the Steel Research Committee of the American Foundrymen's Society, according to C. H. Wyman, Burnside Steel Foundry Co., Chicago, committee chairman.

Agreement on what a snotter is has never been reached among steel foundrymen but it is generally conceded to be a fluid non-metallic material which leaves a slaggy, smooth concavity on the cope side and sometimes on vertical walls of castings.

Factors that may be important in snotter formation listed by the committee include: metal chemistry, tapping and pouring temperatures of metal, furnace refractories, ladle refractories, atmosphere surrounding the metal stream during pouring and the atmosphere in the gating system and mold cavity, metal turbulence, mold and core materials, melting process, deoxidation products, and slag.

The problem is being attacked by direct examination of castings or portions of castings containing snotters. These have been shipped to the AFS Technical Center, along with production history of each casting, by Steel Research Committee members.

Among techniques to be used in the snotter investigation are X-ray diffraction, petrographic and spectrographic studies, and color photography.

First meeting of the Steel Research Committee held to study the castings gathered by committee members occurred April 6. Attending the meeting at the AFS Technical Center were: C. H. Wyman, Burnside Steel Foundry Co., Chicago, chairman; H. H. Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis; W. O. Igleman, National Malleable & Steel Castings Co., Melrose Park, Ill.; Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, Ohio; and W. R. Punko, Wehr Steel Co., Milwaukee.

These present examined surface blemishes on a variety of castings submitted and discussed possible modifications of the snotter defect. They also reviewed nomenclature and discussed whether current terminology is most appropriate.

Fig. 3 . . Snotters form in copes of graphite molds as well as in sand.

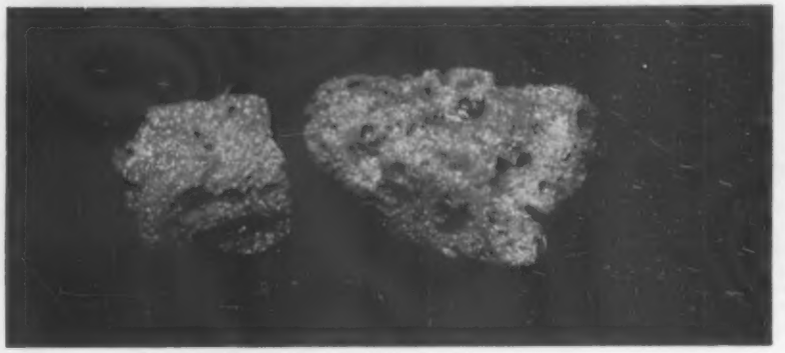


Fig. 4 . . Pieces of large snotter which developed in the ladle prior to pouring. Composition is same as those formed in graphite mold (Fig. 3).

so fluid that it penetrates between the sand grains. For this reason it does not leave much impression on the larger castings, but on lighter castings the slag replaces the metal of the casting.

Color of snotters varies from white to dark yellow to brown. Color depends on the composition. There is a strong tendency to cling to silica molding sand and often analysis shows that much mold material is contained in the defect. Snotters appear as a vitrified mass but are markedly different from normal furnace slag, being thinner and rather difficult to remove.

Comparative compositions of a snotter on steel cast in a sand mold and a graphite mold show marked differences in silica, alumina, and lime content as shown below:

	Sand Mold	Graphite Mold
SiO_2, %	84	43
Al_2O_3, %	5	18
FeO, %	4-5	2
MnO, %	4-6	14
CaO	1	18

Composition depends upon where and how the snotter is taken from the casting and whether the slag is fluid enough to penetrate between the sand grains. Appearance of snotters is shown in Fig. 3, 4, and 5.

Many companies who have been successful in controlling snotters use swirl or whirl gates. Other steel foundries use a double gating system with runners alternating in the

Fig. 5 . . Snotter formed in green sand mold.

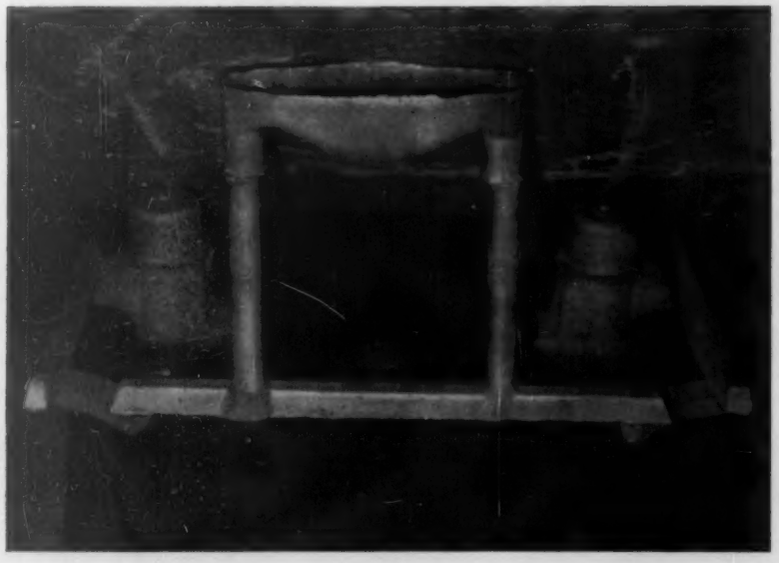


Fig. 6 . . Double gating system used to prevent snotters on 150-lb stainless steel casting by B. W. Magalis, Duriron Co., Inc., Dayton, Ohio.

cope and drag as shown in Fig. 6.

Where the gating system includes blind risers, fewer snotters are likely. A positive pressure system prevents slag from being sucked into the mold cavity. Where a siphoning action occurs, snotters are more prevalent. Pouring into a basin designed to eliminate swirling of the metal in the sprue is good practice. But swirling should be encouraged in the head or feeder.

Many steel foundries have proved that snotters exist in the metal by pouring into graphite or metal molds. They have associated the defect with certain deoxidizing procedures and have found that calcium-manganese-silicon and even aluminum deoxidizers can contribute. Low eutectic slags erode linings also.

Steel companies always frown on decreasing yield by increasing the weight of the gating system. However, while yield may go down on some castings costs can also be brought down as a result of reduced welding due to better gating.

No steel foundry is free of snotter defects, but some have fewer due to better melting, alloying, deoxidizing, ladle, and gating practices. As yield increases, snotter defects increase. Regardless of where or when snotters develop they are bound to enter the mold cavity unless a good gating system is developed and used.

This article is excerpted from the paper "*Casting Finish—Tolerance—Precision*" which will be presented at a Sand session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

AFS Sponsors Seminar for Midwest Foundry Teachers

The board of directors of the American Foundrymen's Society has approved a 2½-day Education Seminar for teachers of foundry and patternmaking in vocational and high schools. The seminar will be held June 14-16 at the Kellogg Center of Michigan State University, East Lansing, Mich.

This is the first program of its type ever offered in the metal castings industry and it is a limited program. About 120 instructors from the states of Michigan, Ohio, Illinois, Indiana and Wisconsin have been invited to attend the seminar at the expense of the American Foundrymen's Society. The number of teachers attending the meeting is limited by the size of the facilities available.

Purpose of the seminar is to improve knowledge and appreciation of the castings industry among instructors in foundry and patternmaking; to improve their teaching methods and facilities; and to encourage more young men to train for the castings industry.

Some of the subjects that will be presented to the instructors are: Training Needs of the Foundry Industry, University Training of Engineers for Foundry Work, In-Plant Training of Foundry Personnel; Planning and Equipping the School Foundry, Work of AFS in the Castings Industry, Availability and Use of Instructional Materials, Coordination of the School Program and Industry, and Development of a Foundry Course to Meet the Needs of Local Foundry Industry.

Planning for the seminar program has been done by the following committee: Richard A. Oster, Beloit Vocational and Adult School, Beloit, Wis.; C. C. Sigerfoos, Michigan State University; Frank C. Cech, Cleveland Trade School, Cleveland; Wm. W. Maloney, AFS; A. B. Sinnett, AFS. Keith Odle, Continuing Education Center, Michigan State University, has cooperated with the committee in preparing the seminar.

Kellogg Center: seminar site

AFS Gets First Editions

The library of the American Foundrymen's Society at the Technical Center, Des Plaines, Ill., has been enlarged by the recent donation of three nineteenth century books on metal casting. The volumes are the gift of AFS member W. L. Todd of South Gate, Calif., an instructor at Pasadena High School.

The three books are: *The Iron-Founder: A Comprehensive Treatise on the Art of Moulding, "The Iron Founder" Supplement,* and *The Encyclopedia of Founding and Dictionary of Foundry Terms.* All of the books were written by Simpson Bolland, "Practical Moulder and Manager of Foundries," and were published in New York in the 1890's. The AFS copies are first editions.

Progress in the industry is marked by passages in these books such as the ones in *The Encyclopedia of Founding* where the reader is advised that the principal use of uranium is to "impart a yellow tint to glass" while the value of magnesium is as an "ingredient for the manufacture of crucibles for metallurgical purposes."

CENTRIFUGAL CASTING of unusual shapes in non-ferrous metals

J. P. KRISHON / *Supt.*
Centr-O-Cast & Engineering Co.
Detroit

The process is basically simple and has great cost cutting potential

■ The permanent mold foundryman quoting on a new job often finds the most difficult problem is that of establishing a manufacturing technique to fit the quality and maintain a competitive price. Normally the centrifugal process is completely ignored because of:

1. Probable high tool cost considerations.
2. Technical aspects of a relatively unknown process.

Actually the centrifugal process is basically simple. The foundryman who ignores its possibilities is overlooking cost cutting potentials that can be large for some types of work.

An investigation of textbook and handbook data on the centrifugal process will not reveal its entire potential. Some work done in Germany during the last war and published in the FIAT reports in 1945 was concerned with centifugal casting of pure aluminum windings in electrical motor rotors. This process has been improved upon in this country. However, until recently most centrifugal work was limited to bushings in brasses, bronzes and ferrous alloys, tubing, soil pipe and babbit liners in medium and large bronze bearings.

An example of an aluminum permanent mold casting successfully made by the centrifugal method is the adapter plate (Fig. 1) being produced for one of the major automotive companies. A general purpose aluminum alloy with the following composition is used:

Copper	3.0-4.5%
Iron	1.0 max.
Silicon	6.5-7.0%
Manganese	0.8 max.
Magnesium	0.05 max.
Zinc	1.0 max.
Nickel	0.5 max.
Titanium	0.2 max.
Others	0.5 max.

The casting is poured in a horizontal position in a mold consisting of a top and bottom cavity (Fig. 2) machined from a hot worked No. 3 pressure die steel. There is no doubt that the casting could be poured successfully in a vertical position. This would necessitate more complicated equipment and, as experimentation has shown, would not improve the metallurgical soundness or unit manufactur-

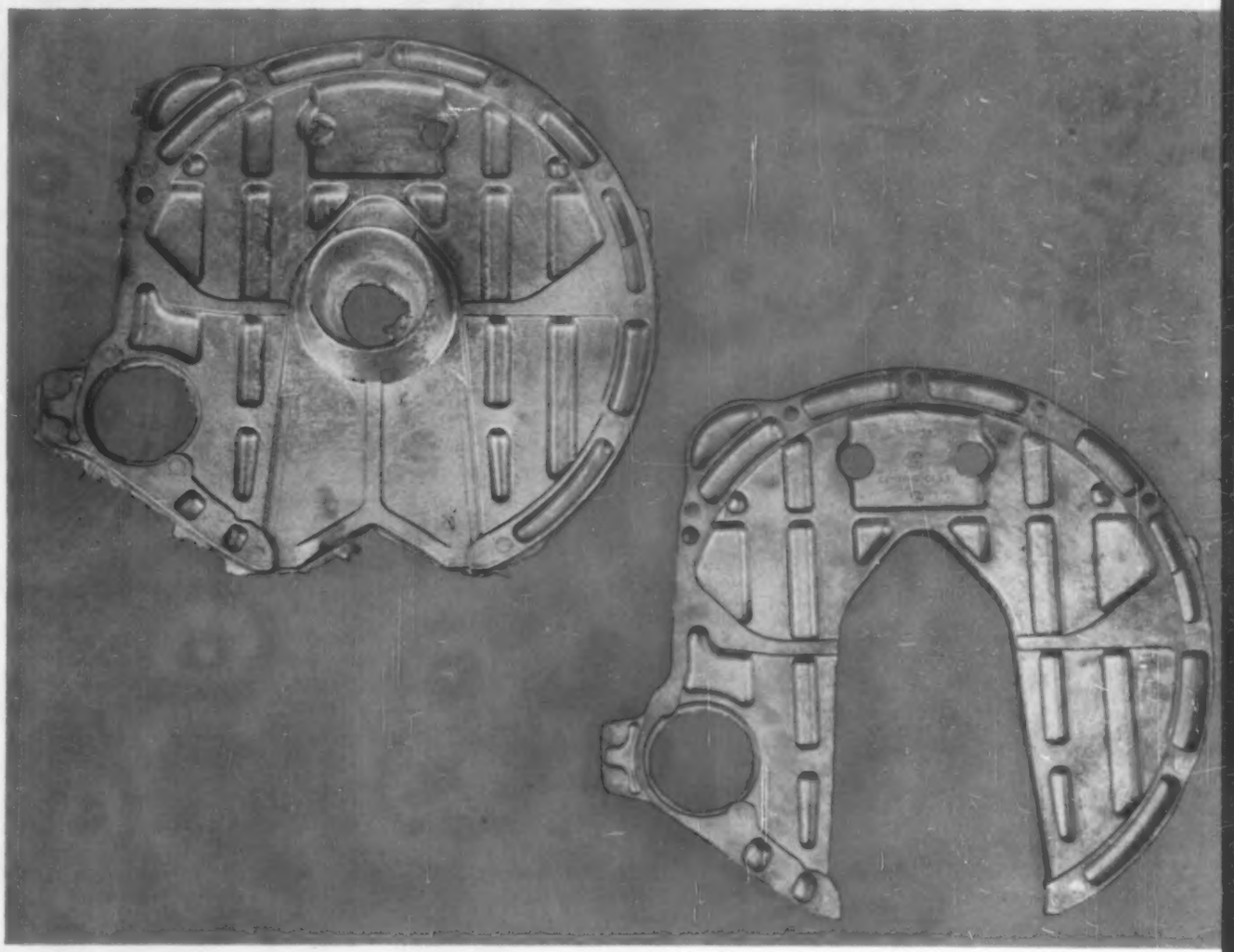


Fig. 1 . . Aluminum adapter plate cast centrifugally in permanent mold, before and after trimming in punch press.

Fig. 2 . . Cope (left) and drag of metal mold for aluminum adapter plate.

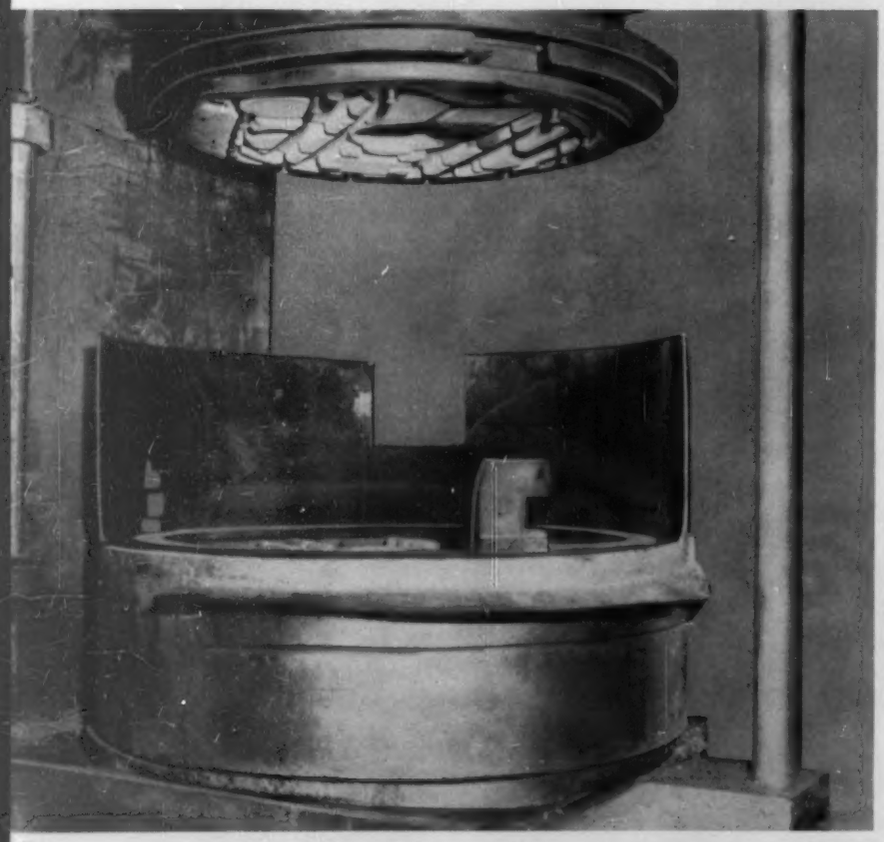


Fig. 3 . . Centrifugal molding machine with cope half of mold raised.

ing cost of the type of casting under discussion.

Action of the stripper pins is similar to conventional permanent molds and their position is important. In general, the pins should be located at the outer periphery of the casting (Fig. 1) with consideration being given to deep pockets and cored out areas. Elevated mold temperatures near the sprue rule this area out for pin locations as high temperatures cause rapid deterioration of pins and pin bushings.

A description of the mechanical details of the machine required to operate this mold is beyond the scope of this article. Basic features of the machine are:

1. A horizontal centrifugal table (Fig. 3) on which the bottom cavity is affixed by bolts or clamps. The table may be operated either by hydraulic or electric motor. Hydraulic is preferable because of the range of speeds available.

2. A superstructure with a hydraulic cylinder lift of 18 in. or greater for the purpose of opening and closing the molds. The superstructure must contain bumper plates or posts to activate the stripper pins.

3. A hood for the spinning mold.

In the manufacture of an unusual part, the centrifugal speeds used for manufacture of bushings and sleeves do not apply. Figure 4 shows a cross section of the adapter plate cut directly through the sprue. The sharp changes in direction undergone by the molten metal as it travels through the mold, in addition to the variations in wall thickness, create some special problems.

Relatively heavy sections are isolated from the sprue by thin sections. Normally, in static permanent molding, chilling of these heavy sections would minimize shrinkage; however, experimentation showed that the unusual conditions encountered when casting the part centrifugally made chilling ineffective.

The mold was initially prepared for operation by preheating with gas torches, and applying a conventional China clay spout about 0.008 in. thick.

Experimentation revealed that three factors required control which were so interrelated that they must be discussed as one. These are: metal temperature, mold temperature, and operating cycle.

Initially, a speed of 250 rpm and a metal temperature of 1350 F were selected. Metal was poured into the mold in a very thin stream. Under these conditions, an operating cycle of four to five minutes was required to allow the sprue sufficient time to solidify. Several hours of operation showed that the mold would retain on operating temperature of approximately 700 to 750 F. Fractures and x-ray examination of castings revealed extensive shrinkage in the heavier sections.

To eliminate the shrinkage, the thickness of spray was increased on thin sections and removed from the thick sections to provide chill. Investigation indicated that pouring metal in a thin stream in addition to altering spraying technique produced castings which were sounder in the areas affected by shrinkage; however, evidences of lamination occurred which were due to the slow pour.

The metal temperature was therefore dropped to 1300 F and the pouring rate increased. This brought about a slight improvement in the shrinkage condition and the mold was allowed to operate for two weeks.

Frequent checking with a surface pyrometer indicated mold surface temperatures in excess of 750 F. Signs of erosion of the mold cavity appeared and severe galling of stripper pins and stripper pin bushings was in evidence. The mold was disassembled and the eroded areas welded and hand-ground to size and contour as determined by use of a template.

Fig. 4 (right) . . Cross section of adapter plate showing sprue in center and variations in thickness of the casting.

The mold was prepared again with 0.008 in. spray and the metal temperature was reduced from 1300 to 1250 F to reduce the mold temperature. Under these conditions, shrinkage was still evident in the heavy sections and chilling made little improvement. Therefore, speed was reduced to 160 rpm and the sprue size increased to make possible rapid pouring.

The lower pouring temperature permitted shortening the operating cycle from approximately four minutes to three minutes. The areas of shrinkage showed marked improvement and the mold was put into operation for several weeks on a 24-hour per day basis. Periodic checks with the surface pyrometer revealed that mold temperatures reached 700 F. Signs of erosion appeared after the first week and by the middle of the second week, stripper pins again showed galling.

The mold was repaired again, resprayed and put into operation. The metal was now poured at 1200 F. On a 24-hour per day basis, at an operating cycle of three minutes, several weeks passed with no erosion evident. Stripper pins remained in good working condition and mold temperatures remained under 700 F. The shrinkage previously evident in heavy sections disappeared. X-rays and sectioning of parts indicated sounder structure than that of obtainable by gravity methods.

It was then felt that the process was ready for production and with some modification the equipment was rigged to permit one man to operate two molds. On two molds, operating three shifts per day, each operator was able to produce 300 castings or more per 8-hour day. The operator is provided with relief time each hour.

Using the final technique developed, six molds in operation three shifts per day, five days per week, have run more than 420,000 pieces with no erosion evident in the mold cavity and only occasional down time to replace stripper pins or stripper pin bushings. For the past 12 months scrap has been less than 6 per cent. Molds are taken down once each week and the cavities sand blasted and re-sprayed.

Colloidal graphite spray was found to be beneficial in aiding ejection of the casting and extending the life of the China clay spray. In addition, the mold is blown off with an atomized water spray after each casting is ejected. This has the dual effect of clearing metal flash from the parting lines in addition to assisting in keeping mold temperatures within the desired range.

The thin gates and minimum amount of flash lead to the use of a trim die rather than band-sawing and grinding. In a conventional crank type press equipped with an air clutch drive, one operator can trim 1400-1600 castings in an eight hour day. No subsequent grinding is necessary. The casting, including sprue and flash, weighs 9.0 lb while the finished casting weighs 7.3 lb. This high yield of 81 per cent, together with low scrap, fast operating cycle, and ease of trim has rendered the process far more economical than conventional gravity methods for applicable castings.

The low pouring temperature minimizes the danger of gas porosity and lessens oxide formation due to agitation. However, a problem is created in fluxing and skimming practices because adequate drying of dross skimmings is almost impossible at this low temperature. As a result, skimmings will be found to contain a high percentage of good metal, and smelting operations for salvage may be necessary.

The cost of purchasing or creating equipment to produce castings centrifugally is higher than for conventional static permanent molding. But the expense is quickly amortized by reduced operating cost.

Without exception, sounder castings are obtained by this method than can be produced by gravity casting methods for the same type of work. In addition, for those parts converted from conventional to centrifugal methods, an average unit cost saving of more than 40 per cent has been realized. This is attributable largely to two-mold per man operation, high yield, and extensive savings in the cleaning room.

The foundryman who has no access to engineering facilities would be well advised to contact a reputable manufacturer of permanent mold equipment before embarking on a centrifugal casting program.

This article, based on the paper *"Centrifugal Casting of Unusual Shapes in Non-Ferrous Alloys,"* will be presented at a Light Metals Session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

Thomas W. Pangborn Gold Medal

■ This is the Thomas W. Pangborn Gold Medal which the American Foundrymen's Society will award for the first time this month. The Pangborn medal completes the list of six gold medals that the society has to award in recognition of achievement in the metal castings industry. Four medals were created in 1924 and a fifth was added in 1946.

The theme of the Pangborn medal is educational leadership and it is presented in the name of an industrial leader who has made numerous contributions to educational activities. For many years Thomas W. and John C. Pangborn, president and vice-president respectively of the Pangborn Corp., have supported religious, charitable and educational projects with generous grants. During the past year, Pangborn Halls have been opened on the campuses of the University of Notre Dame and Mount Saint Mary's College. Both of these are residence halls donated to the schools by the Pangborns.

Each of the six AFS gold medals has been designed to feature a theme characteristic of its donor. The theme of the Pangborn Medal is *Educational Leadership;* the McFadden Medal, *Achievement;* the Seaman Medal, *Kindliness;* the Penton Medal, *Vision;* the Whiting Medal, *Industry;* the Simpson Medal, *Knowledge.*

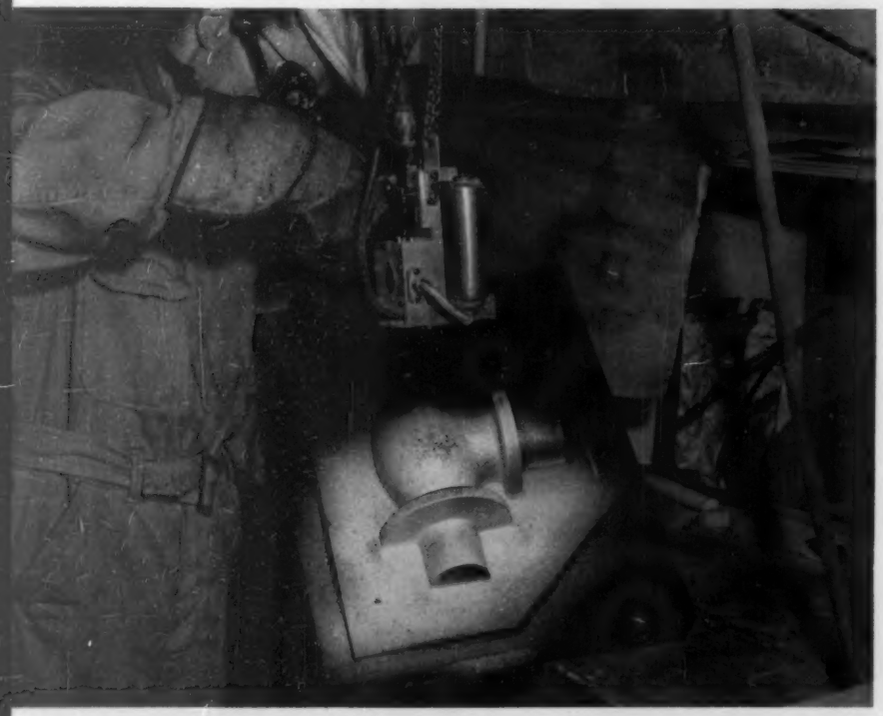
The awarding of a gold medal of AFS has been likened to the Nobel prize in importance because both embody the spirit of service. Since 1924, over 50 outstanding men of the metal castings industry have been recognized by AFS as Gold Medalists and others have been accorded the distinction of Honorary Life Membership.

The first to receive the Pangborn medal will be Charles C. Sigerfoos of Michigan State University. His citation states that the award is made, "For outstanding contribution to the Society and the Castings Industry, particularly in the field of education of engineering student for foundry careers."

THREE WAYS TO MAKE EPOXY RESIN PATTERNS

E. J. McAfee / *Master Patternmaker*
Puget Sound Naval Shipyard
Bremerton, Wash.

You don't need curing equipment to make plastic patterns anymore



Master pattern is sprayed with a thin coating of a low melting alloy.

■ Plastic patterns have become important again with the introduction of the epoxy resins.

Phenolic resins, introduced during the early part of World War II, were given a thorough trial in pattern construction but were found wanting and foundries lost interest in them due to their lack of dimensional stability and their low impact strength.

The epoxy materials seem fairly certain to find a place economically between the low cost wood and the more expensive metal patterns. Considerable research is being continued by the government and by private industry.

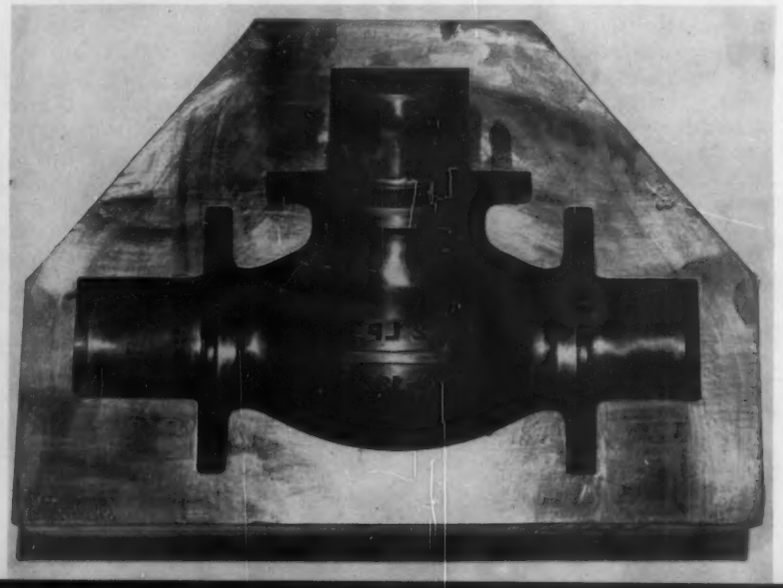
The epoxy resins may be cast into molds made of gypsum, wood, or metal. They may be reinforced with glass cloth, or any basic metals or their alloys to increase impact strength. They will cure at normal room temperatures, thereby eliminating the need for special ovens or curing equipment.

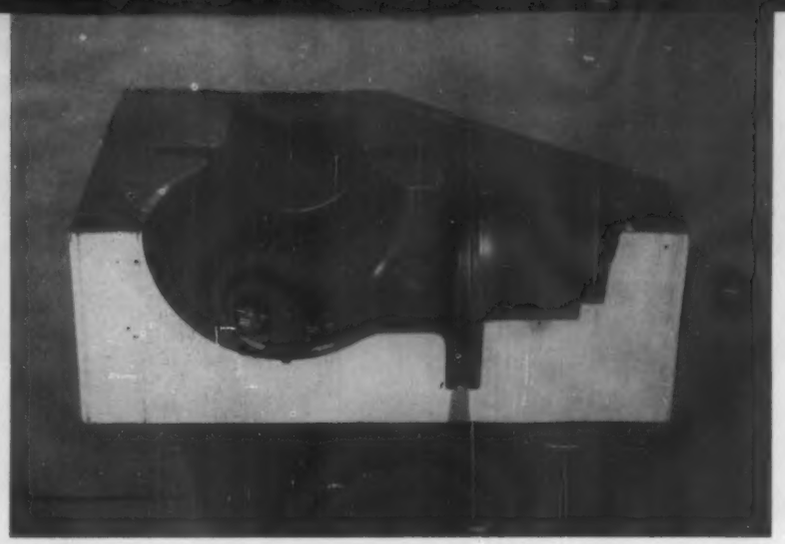
The epoxies are applicable to most methods of pattern manufacture and combinations of materials. Up to now there has been no epoxy resin available and suitable for patterns that can be cast in much volume without an accompanying unpredictable and varying shrinkage. We soon reached the conclusion that when using the epoxy casting resins they must be confined to thicknesses of ⅜ in. or less. This meant the use of other materials in conjunction with the casting resins to give the patterns the required strength and stability.

The Pattern Shop and the Materials Laboratory at the Puget Sound Naval Shipyard are now conducting a series of tests to develop and manufacture plastic foundry patterns that will justify their use both economically and technically. They do have their limitations, but when these are recognized and corrective measures taken in the manufacturing processes these limitations

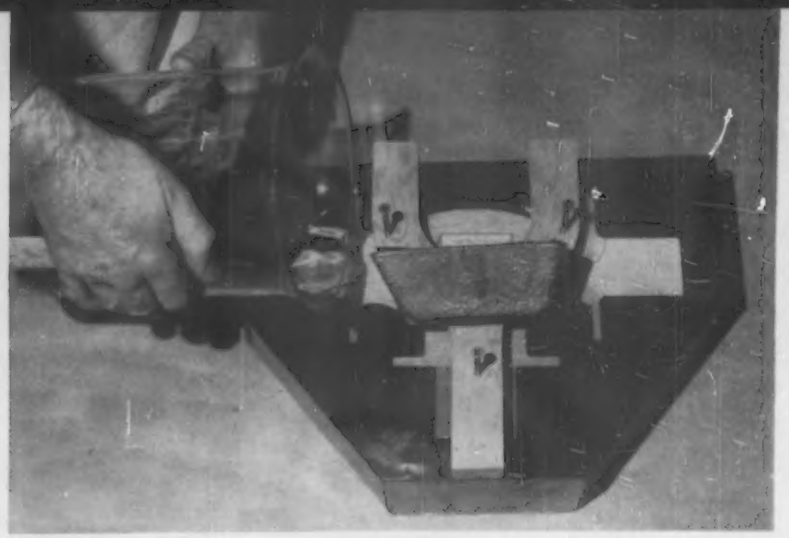
Plaster mold is poured with metal-coated pattern forming mold cavity.

Metal facing stays with plaster mold, makes dehydration unnecessary.





Cross-section of plaster mold which has been readied for casting plastic.



Plastic is poured after wooden core is located, held down in plaster mold.

can well be overcome, thereby making some of the epoxy resins excellent pattern materials.

Several methods have been developed to successfully cast the various types of patterns and core-boxes.

The first method of construction includes patterns with varying shapes and volumes but with limited dimensions of one or two feet in breadth, width, or diameter. The casting resin is poured around an inert core plug, which can be made of many materials. These include phenolic core foams, calcerite, other gypsum products, polystyrene beads, wood chips, vermiculite, and even sand and gravel.

Some manufacturers of epoxy resins have only just recently developed and put on the market new formulas called "core resins" for this very purpose. These are too recent to have been fully evaluated. Another inexpensive inert type filler of a volcanic type rock was disappointing in several ways during tests. It absorbed moisture like a sponge and was difficult to machine.

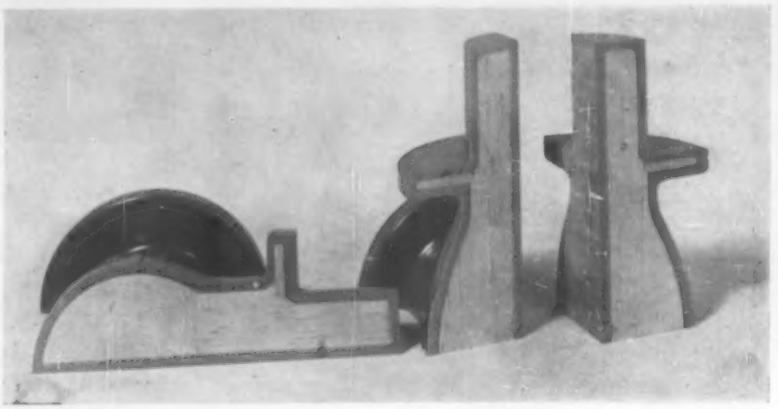
The filler or core material we have found best up to this time for this method of construction is a good sugar or white pine, dry kilned to a moisture content of six or seven per cent.

■ **For the first method,** a master pattern is required with no extra allowance for contraction other than that necessary for the normal shrinkage of the final metal castings. The master is used to make the mold for the plastic pattern. The molds are usually made of plaster, and we prefer that they be faced with a spray of a low melting eutectic alloy. The master pattern may be of any convenient material; even an old pattern to be replaced could be used. For a parting agent between the master and the sprayed alloy, a thin coating of glycerine is rubbed on the master pattern, placed in a retaining frame, then sprayed with a thin coating of a low melting alloy. The metal thickness is not important and may vary from $\frac{1}{64}$ to $\frac{1}{32}$ in. Spraying any heavier is just a waste of time and material.

The gypsum plaster may then be poured, covering the metal faced master to the height of the mold frame. As soon as the plaster sets the mold can be turned over and the master can then be easily withdrawn. The mold surface should be polished with a fine grade of steel wool and crocus cloth. The mold is now ready for the application of the parting agent.

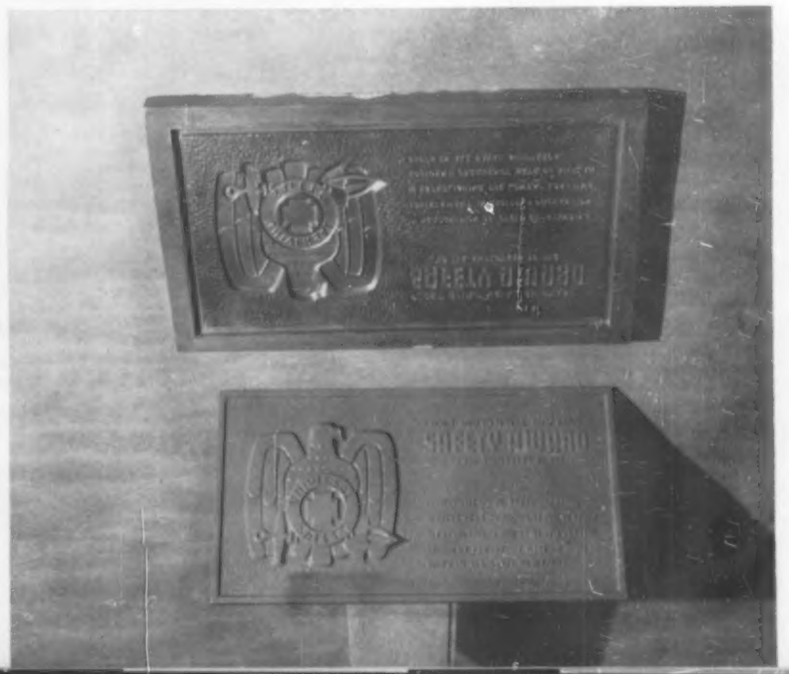
The advantage of using this eutectic alloy facing for the plaster molds is two fold. First it makes it unnecessary to completely dehydrate the gypsum molds before casting the resins into them, and second, the plastic castings can be readily removed without damage to the molds, making the molds available for additional castings.

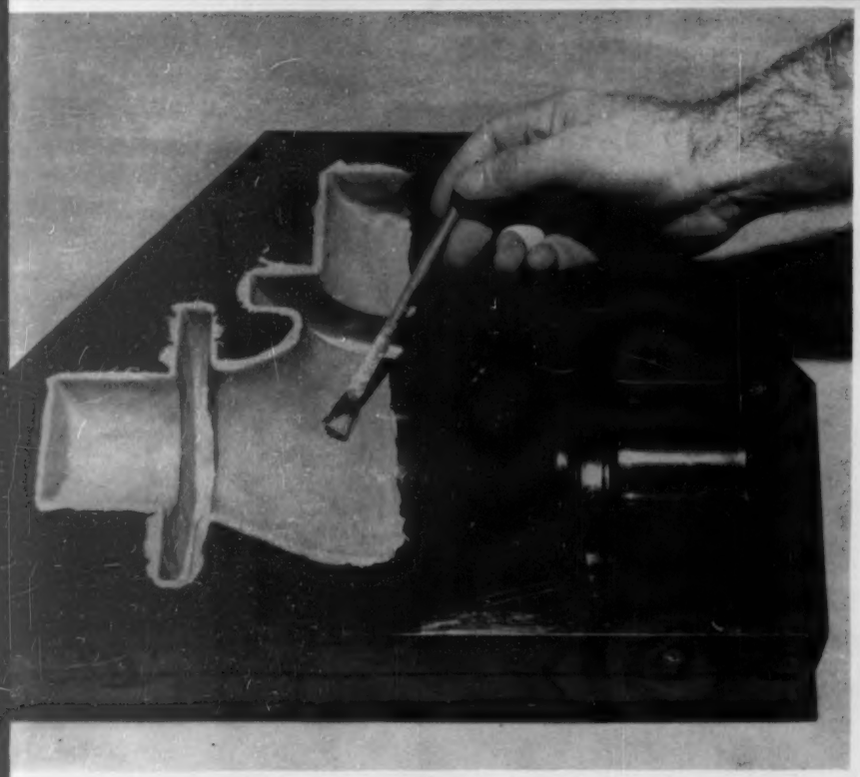
The most effective parting agent we have found for this purpose (and, in fact, for all molds into which the epoxy resins are poured



Globe valve pattern sectioned to show wooden core, ¼-in. plastic coating.

Thin patterns (⅜ in. thick, ⅝ in. in few areas) can be cast solid.





Build-up of pattern in third method starts with brushed-on resin layer.

Glass cloth strengthens pattern.

Core material fills out pattern.

or applied) is a sealant manufactured from a copolymer vinyl, chloride-vinyl acetate sheet hand-shaved and cut with enough methyl ethyl ketone to produce a liquid of the consistency of a light syrup. This is a typical lacquer base. We suggest a colorant be added to make the application visible. It can be brushed or sprayed on the face of the mold. The spraying method is preferred as it can be applied more evenly.

After this has thoroughly dried, a coat of hard carnauba wax is applied and lightly polished. Over this is applied a coating of parting agent. The mold is then ready for the pouring of the plastic resin. We have found the epoxy casting resins with aluminum fillers to be the most adaptable for this type of pattern.

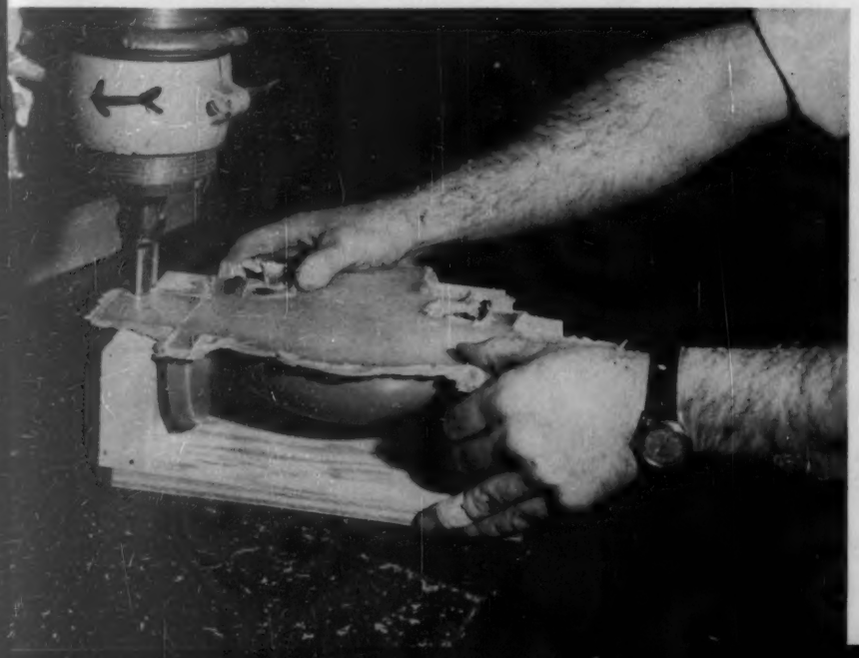
■ **The second** and most logical process is the casting of solid patterns entirely of the epoxy casting resin combined with an aluminum filler. This method is suitable for such types of patterns as placques or flat patterns of a general uniformity of thickness up to ¾ in. and not exceeding one half or ¾ in. in spots.

The procedure for making the mold for this type of pattern is the same as for method No. 1.

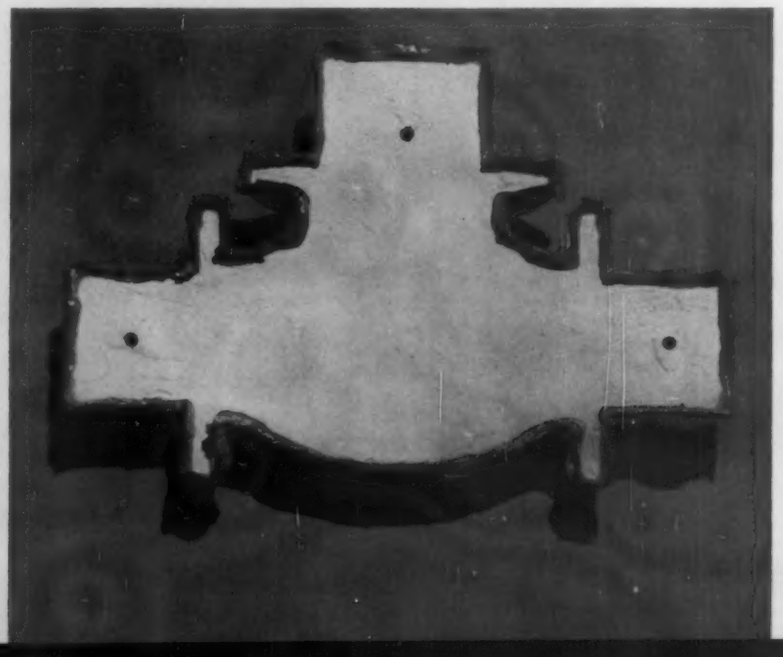
■ **Method number three** can be used to advantage on practically any size pattern, especially where the volume is great and/or there are very thin sections. It is used for

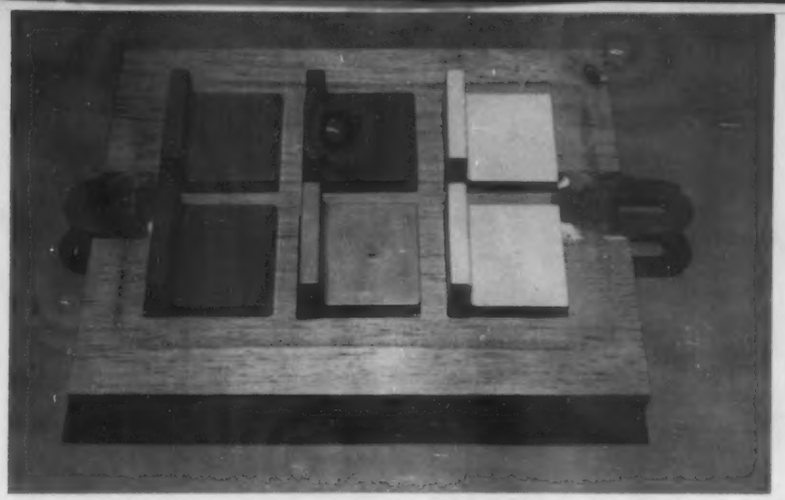
Filler includes plastic beads.

Router bit mills off extra material down to parting line of cured pattern.



Plaster filler can also be used but plastic plus hardener is preferred.





Test patterns mounted on plate were used to check ease of removal from sand. Each was different epoxy resin; one failed to release properly.

the manufacture of dies and jigs. This consists of three coats of die facing epoxy resin material applied on the surface of the mold. The remaining cavity is filled with a backing material.

The same type of mold can be used as is prepared for the preceding two methods. The first layer of resin is a die facing resin applied by brush in a heavy layer. After this layer is partically cured but still tacky another layer is brushed on and small sections of glass cloth are then placed over the surface and overlapped, with the resin soaking through the fibres. A third layer is spread over the glass cloth before it has partly cured. This will give a mold surface of approximately 3/16 in.

After this has thoroughly air cured, the cavity in the pattern is filled with a backing material consisting of polystyrene beads with a suitable hardener or any other suitable core material. These fillers can be poured a little above the parting line and milled off after curing with a router bit (preferably tungsten tipped) to the actual parting line. Any filler used should be of some inert material that will be dimensionally stable and will not shrink after casting. This is necessary to avoid any distortion of the facing resin. All necessary draw plates or inserts must be placed in the cavity before pouring.

The addition of the proper amount of anhydrous silicate to the casting resins, preferably to those with the aluminum filler, will reduce them to the viscosity necessary so they can be used successfully as a die facing material. This makes possible the use of the casting resin as an all purpose resin for the average pattern shop.

A plaster of Paris filler having a low tensile strength should be poured up to within ¼ in. of the parting line, then covered with a facing of epoxy casting resin.

The most satisfactory filler or core material we have tested up to now is the polystyrene beads.

Various test patterns were used to evaluate the sand releasing qualities of various epoxy resins. Ell shape test patterns were used to test the vertical and flat lift. The synthetic sand used for testing is a type considered to be one of the most severe for this purpose. The mixture, given in parts by weight, was as follows:

new silica sand	95
western bentonite	5
silica flour	2.5
dextrine gums	0.3
cereal binder	0.7
perlite	0.6
fly ash	0.05
moisture content	4.6 per cent

These test patterns were left in the rammed up molds as long as 72 hours with excellent results.

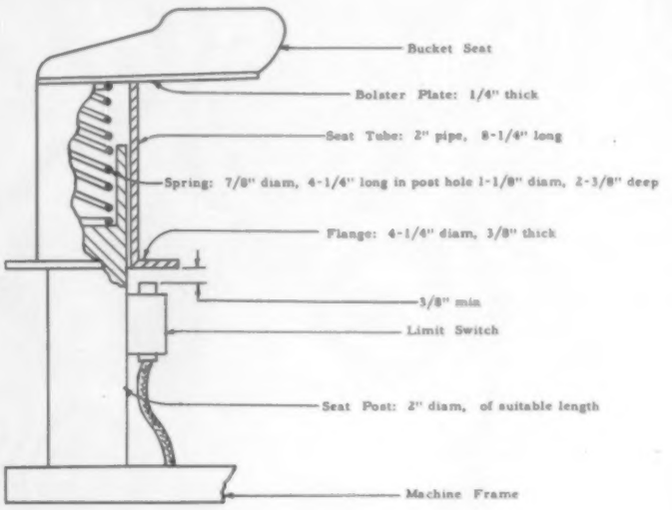
This article, based on the paper *"The Use of Epoxy Resin as Pattern Material,"* will be presented at a Pattern session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

Now, There's An Idea!

Safety Seat for Sand Cutter

■ Working in front of the sand cutting machine while it was running placed the operator in constant danger. Recognizing this threat, Herman Schwarz, general machine department, National Cash Register Co., Dayton, Ohio, suggested a switch be mounted on the seat assembly so that the machine would run only when the operator was in the seat.

At a cost of only $35, this was accomplished as shown in the drawing below. A limit switch was attached to the seat post and a flange was added to the seat tube to engage the switch. The post was drilled to accommodate a coil spring capable of holding the seat away from the switch when the operator was not seated.—*H. F. Heil, editor, NCR Factory News*


Bucket Seat
Bolster Plate: 1/4" thick
Seat Tube: 2" pipe, 8-1/4" long
Spring: 7/8" diam, 4-1/4" long in post hole 1-1/8" diam, 2-3/8" deep
Flange: 4-1/4" diam, 3/8" thick
3/8" min
Limit Switch
Seat Post: 2" diam, of suitable length
Machine Frame

How Midwest Foundry SEALS SHELLS with RESIN SLURRY

■ A water slurry of the same resin used for bonding the sand in shell molds is being employed by Midwest Foundry, Coldwater, Mich., to cement shell halves together.

Procedure is simple. A metal frame, corresponding in shape to the desired glue line at the parting, is prepared for each shell. The resin is mixed with water, making a suspension that sticks to the frame without dripping. As the hot shells are removed from the machine, they are broken into cope and drag. The resin suspension is applied to the drag, the cope is position, and the assembly is clamped tightly in an air-operated press. Residual heat does the rest.

Midwest likes the technique because it puts the resin right where it's wanted. Fewer castings are lost from poor seals because the water retards setting of the glue long enough for it to flow along the joint line while the two halves are under pressure.

Using dry resin shaken onto the drag by means of a vibrator, Midwest's previous practice, the resin sometimes got into the mold cavity. Sometimes it set too fast leaving gaps in the bond which enabled molten metal to force the shell halves apart.

PHOTOGRAPHS AND INFORMATION SUPPLIED THROUGH COOPERATION OF BARRETT DIV., ALLIED CHEMICAL & DYE

Mold, made as unit, is broken in half after removal from machine.

Liquid glue is applied at parting by means of applicator frame.

Cope is placed on drag, shell is ready for curing of joint seal.

Press holds shell halves together while residual heat cures seal.

DIRECTORY of EXHIBITORS and PRODUCTS

Two hundred and forty exhibitors contribute to the largest Castings Congress ever held. Here is a comprehensive guide to the big show.

■ This page begins a detailed directory and buyers guide to the 1956 AFS Castings Congress and Show at Atlantic City May 3 to 9. The directory and buyers guide is divided into three main sections:

1. First is an alphabetical listing of exhibitors, giving name of company, address, products exhibited, representatives at the Congress, and booth number.

2. The second section contains a giant fold-out map of the Convention Hall. In addition to giving an overall view of the hall, the map shows the name and location of each exhibitor.

3. The third section contains a buyers guide and handy reference directory classified by products on exhibit, the name of the exhibitor, and his booth number. Here prospective customers can look up products, machinery, materials and services and find where they are exhibited. MODERN CASTINGS advertisers are listed in heavy type.

The entire section, prepared by the editors of MODERN CASTINGS, represents a most comprehensive guide and directory to important supplies and suppliers of the foundry industry.

EXHIBITORS

Acme Resin Corp., Forest Park, Ill. Hot and cold shell molding resins, coated sands, foundry resins. **Representatives:** R. E. Waller, John Albanese, Sanford Breed, Phil Erlandson, Earl S. Dietrich, R. M. Purinton, Sam Ringel, M. G. Stevens, Mal. Stevens, Jim Winton, R. R. Dobesch **Booth No. 1305**

Adams Company, Dubuque, Ia. Cherry and aluminum flasks, upsets, jackets, bands, molding machines, accessories. **Representatives:** John A. Cameron, Fred Beyer, Paul E. Toepel, Robert J. Biasi, Roy Clemens, John B. Meyer **Booths Nos. 808-810**

Aetna Plywood & Veneer Co., Chicago 22, Ill. Stabilite. Carving wood for models and patterns. **Representatives:** Claus R. Sutor, Harold O. Stadt **Booth No. 113**

A.I.C. Engineering Co., Inc., Indianapolis, Indiana. Compounds to reduce abrasion, impact, corrosion and noise. **Representatives: John Hilldale, Leo Curran,** C. J. Scherer **Booth No. 137**

Air Reduction Sales Co., Inc., New York 17, N. Y. Desulphurizing and injection process, CO_2 core hardening, powder cutting equipment, torches, regulators, electrodes, industrial gases. **Representatives:** J. M. Crocket, J. J. Clenny, W. R. Lysobey, E. B. Walker, N. F. Moody, W. P. Molony, W. Goerg, Jr., A. J. Granata, T. S. Leitch, B. Mende, L. F. Kilmarx, J. W. Thistle, J. Perry, R. A. Speck, G. Milne, G. Bole, B. Gray **Booth No. 902**

Ajax Electrothermic Corp., Trenton 5, N. J. High frequency induction furnaces for castings, forgings, carbides, and vacuumelts. **Representatives:** G. H. Clamer, A. D. Meyer, F. T. Chesnut, J. R. Coley, T. R. Kennedy, W. F. Hipple, S. G. MacNeill, W. J. Cullen, B. J. Campbell, D. M. Clarke, C. B. Mitchell **Booth No. 1418**

Ajax Flexible Coupling Co., Inc., Westfield, N. Y. Vibrating conveyors, feeders and screens, flexible couplings. **Representatives:** Wayne Belden, Robert G. Cady, Thomas H. Brumagin, George Kelso, James T. Gordon, James A. Gordon, E. E. Broberg, J. Guy Griffith, C. P. Levinger, L. V. Hooper, Ralph J. Hutchinson, Robert R. Baumann **Booth No. 1840**

Ajax Engineering Corp., Trenton 7, N. J. 60-cycle induction melting furnaces for foundries handling aluminum, brass, bronze, zinc **Booth No. 1420**

Ajax Metal Div., H. Kramer & Co., Philadelphia, Pa. Brass, bronze & nickel silver ingots, special alloys, hardeners, copper shot, phosphor copper shot & waffle. **Booths Nos. 303-305**

Allen Industrial Products, Inc., Battle Creek, Mich. Mechanical material handling equipment. **Representatives:** R. L. Allen, Lyle Harbock, G. E. Mitchell, R. K. Jeffers **Booth No. 1946**

Allis-Chalmers Mfg. Co., Milwaukee 1, Wisc. Shakeouts, core dryers, vibrating screens, arc furnace control, blowers, switchgear, transformers, motors, drives, electric control, fork lift trucks, tractor shovels. **Representatives:** O. Noeske, A. Lemplin, H. E. Hanpbear, C. E. Dandois, R. H. Black, D. Kuethe, Karl Rathman, John C. Walker, C. C. Kirk, Chas. Webster, J. M. Halle, O. N. Olson, Glen Reed, Kurt A. New, H. W. Rabe, A. H. McNaughton, H. Cohenour, D. Cavenaugh, R. N. Brown, Carl Loper **Booths Nos. 1737-1739**

Alloy Metal Abrasive Co., Ann Arbor, Mich. Electric cast steel for all types of blast-cleaning operations. **Representatives:** J. F. Ervin, J. A. Pearson, C. P. Vogel, R. W. Olsen, A. L. West, W. R. Penrice, W. C. Marcus, T. D. Rogers, N. T. Ruddock **Booth No. 203**

Alpha-Lux Co., Inc., New York 38, New York. Refractories, moisture tester, riser covering materials. **Booth No. 136**

American Air Filter Co., Louisville 8, Ky. Dust collection equipment. **Representatives:** W. G. Frank, John Hellstrom, J. M. Kane, J. G. Liskow, D. E. Bonn, J. S. Munson, R. C. Ortgies, H. E. Soderberg, Mel Buettner, Paul Aften, Robert D. Moore, Richard W. Smith, Robert D. Moore, Frank Delph **Booths Nos. 1309-1311**

American Alloys Corp., Kansas City, Mo. Aluminum alloy ingot for sand, permanent mold and die casting. **Representatives:** T. E. Kramer, John Benson, John Clay, W. A. McKnight, Jr., O. W. Puhan, G. J. Gibson **Booth No. 1902**

American Colloid Company, Chicago 54, Ill. Western bentonite, southern bentonite, wood flour. **Representatives:** Clyde A. Sanders, William D. Weaver, Roy H. Huebner, Roy H. Harris **Booth No. 912**

American Cystoscope Makers, Inc., New York 59, N. Y. Borescopes, optical flats and miniature lamps. **Representatives:** H. E. Cawley, J. C. Brown, D. V. Thomas, R. F. Labarre, R. V. Lange, J. E. Held, F. J. Wallace, W. Blakey **Booth No. 123**

American Foundrymen's Society Publications. AFS manuals, handbooks, texts, transactions, reports, symposia, bibliographies. **Representatives:** AFS Technical Center staff. **Booth No. 220**

American Foundrymen's Society Research Exhibit. AFS—sponsored research, projects for the foundry industry. Working models, equipment and graphs. **Representatives:** Members of AFS Research Committee. **Lobby**

American Gas Association, New York 17, N.Y. Gas service information center. **Representatives:** Jack Richards, E. A. Ernst, John Lyons, Jack Mohr, H. P. Holz, R. A. Gregory **Booth No. 211**

American Metal Market, New York 38, N. Y. Publishers of American Metal Market (daily) and Metal Statistics (yearly). **Representatives:** R. A. Langer, A. W. P. Trench, W. J. Bowen, D. R. Langer, Chas. A. Price, Herbert J. Blais **Booth No. 237**

American Refractories & Crucible Corp., North Haven, Conn. Carbide and graphite crucibles, refractories, stoppers, cements, special shapes. **Representatives:** G. T. Hubbell, G. H. Calligan, R. L. Space, P. Trook, R. Karg, W. Libby, L. Feldballe, R. Thurber, P. McCollum, R. M. Stuart **Booth No. 328**

American Steel Abrasives Co., Galion, Ohio. Certified metal abrasives, grit and shot for blast cleaning and peening operations. **Representatives:** L. A. Cline **Booth No. 1829**

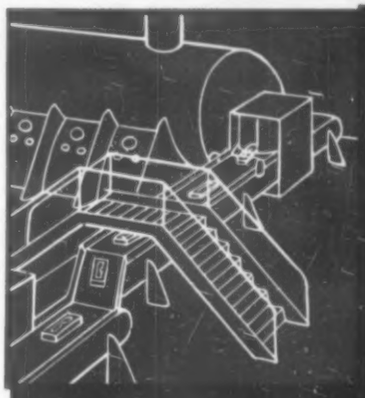
Apex Smelting Co., Chicago 12, Ill. Aluminum, magnesium and zinc base alloys, aluminum foundry fluxes. **Representatives:** A. J. Peterson, D. L. Colwell, O. Tichy, W. N. Brammer, B. L. Swick, J. W. Walsh, E. Montie, B. Murray, F. W. Foss **Booth No. 1413**

Arcair Co., Lancaster, Ohio. Electirc arc—compressed air gouging and cutting torches and electrodes. **Representatives:** Myron Stepath, Elmer Lehmkuhl **Booth No. 439**

Archer-Daniels-Midland Co., Cleveland 2, Ohio. Core oils, sand stabilizers, parting compounds, foundry resins, special binders. **Representatives:** L. P. Robinson, W. B. Bishop, C. J. Bourassa, L. H. Canfield, C. E. Coulter, R. D. Dodge, T. H. Grey, R. V. Hunter, J. C. Gore, James Keech, J. H. King, W. C. Kremer, L. M. Lund, J. L. Meckel, J. W. Mentzer, Dan Pendergast, H. Ramsey, L. E. Rayel, E. L. Shaughnessy, W. A. Zeis, A. Dorfmueller, Dan Chester, R. J. Mulligan, O. J. Myers **Booths Nos. 1636-1638**

Austin-Western Works, Construction Equipment Div., Baldwin-Lima-Hamilton Corp., Aurora, Ill. Hydraulic "indoor-outdoor" crane. **Representatives:** R. H. Diller, D. J. Phillips, H. P. Lockhart, E. C. Brown, J. R. Maulcook, T. R. Bradford, L. G. Groff. **Booth No. 1943**

Ayers Mineral Co., Zanesville, Ohio. Natural bonded molding sand, core



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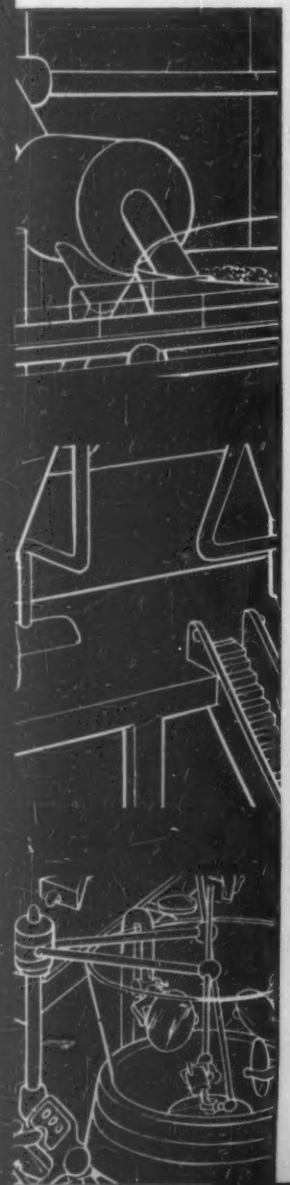
sand, silica flour, sand blast sands. **Representatives:** Ed C. Sawyer, C. A. Gorsuch, Dick Lincoln **Booth No. 312**

Baird Associates, Inc., Cambridge 38, Mass. Spectromet, shell molds, and other spectrographic equipment for foundry use. **Representatives:** Dr. Walter S. Baird, Dr. Jason L. Saunderson, Henry J. Levesque, John P. O'Connor, Robert I. Ray, Robert Roy, Richard E. Reiss, Robert F. Feland, Jr., Jackson H. Dutton, W. M. Draisin **Booth No. 1835**

Baroid Div., National Lead Co., Chicago 4, Ill. Wyoming bentonite, waterless precision casting binder. **Representatives:** Kemp S. Lewis, K. A. Miericke, R. N. Spangler, R. G. Megaw, C. B. Schureman **Booth No. 208**



Barrett Div., Allied Chemical & Dye Corp., New York 6, N. Y. Resins. **Representatives:** E. A. Johnson, J. N. Grove, W. H. Hough, A. W. Dodd, Lee Stark, B. McMillan **Booth No. 1944-A**

C. O. Bartlett & Snow Co., Cleveland 5, Ohio. Sand, mold and castings handling equipment, cupola melting and dust collecting equipment. **Representatives:** H. S. Hersey, C. J. Neville, C. O. Bartlett, J. R. Hersey, B. A. Smith, H. A. Christy, H. T. Bourne, J. J. Watson, H. C. Orr, J. M. Burnett, R. J. Kendall, W. Bancroft, Jr., E. G. Hansen, J. D. Fraser, P. J. Hanson, M. E. Dawson, L. F. Harding, C. W. Lueders, M. Kuzio, F. W. Neville, N. R. Kidd **Booths Nos. 1722-1726**

Beardsley & Piper, Div. Pettibone Mulliken Corp., Chicago 39, Ill. Sand preparation, ramming and molding machinery and shell molding, coreblowing and sand preparation machinery. **Representatives:** E. J. Seifert, C. V. Nass, H. G. Schlichter, L. H. Dennen, G. Koren, Z. Madacey, F. B. Hall, William Goetz, James Brame, W. F. Guth, A. Bisenella, O. W. Winter, J. Japuntich, R. Mitchell, R. Lund, G. Johnson, W. Jones, W. Diller, G. R. Freidrich, H. C. Weimer, A. Miller, R. Nosek, H. J. Krause, J. L. Battenfeld, L. G. Turner, H. Rachubinski, C. Branaman, K. Krause, W. Fraser, M. Ward, M. Wright, T. Skill, Mrs. Z. Dome, R. Scanlan **Booths Nos. 416-420-422-503-507-509-504-506-508-603-607-609**

Beryllium Corporation, Reading, Pa. Casting ingots, sand castings, cast dies, shell patterns, core boxes. **Representatives:** Paul C. Holland, George Scargle, L. F. Boland, Walter S. Pollard, Richard Baureithal, Ted Roberts, Paul Scherbner **Booth No. 340**

Black, Sivalls & Bryson, Inc., Kansas City 26, Mo. Foundry flasks. **Representatives:** M. G. Purpus, C. E. Boettcher, Leo Gardner **Booth No. 209**

Blastcrete Service Co., Inc., Los Angeles 11, Calif. Manufacturers and distributors of Blastcrete guns for all types of refractory gunning. **Representatives:** Jim R. Douglas, Grayson K. Bailey **Booth No. 112**

Blaw-Knox Co., Blaw-Knox Equipment Div., Pittsburgh 38, Pa. Clamshell buckets. **Representatives:** Arnold Hooper, T. D. Harter, C. F. Weiblen, Cloyd Fike, Chas. Minglin, T. F. Smith, Jr. **Booth No. 1910**

Borden Company, Chemical Div., New York 17, N. Y. Core and shell mold resins. **Representatives:** D. J. Murray, J. A. Meima, R. S. Hull, H. K. Salzberg, C. Barber, F. Todd **Booths Nos. 1914-1916**

Brush Beryllium Co., Cleveland 3, Ohio. Beryllium alloys, beryllium copper, continuous cast rolling billets, synthetic mica. **Representatives:** N. W. Bass, B. Sparks, L. A. Fowles, W. W. Beaver, R. G. O'Rouke, C. W. Schwenzfeier, J. DeJarnett **Booth No. 301**

Budd Co., Philadelphia 32, Pa. Gamma radiography, remote exposure equipment and radiography sources. **Representatives:** C. F. Thompson, T. W. Healy, Dr. A. J. Stevens, A. V. Kelley, R. H. Holliday **Booths Nos. 1337-1339**

Campbell-Hausfeld Co., Harrison, Ohio. Metal melting furnaces, gas or oil fired. **Representatives:** E. B. Hausfeld, R. G. Kluener, C. E. Small, W. J. Wooley, V. A. Prieogle, R. H. Campbell, F. C. Miller. **Booths Nos. 2101-2103**

Canton Chaplet & Chill Div., W. L. Jenkins Co., Canton 2, Ohio. Foundry chaplets, chills and chill nails. **Representatives:** W. L. Jenkins, G. H. Shackelford, C. H. Cousineau, J. H. Hatten, Jr., R. W. Clark, J. R. Crain, O. B. Marx, M. K .Smith. **Booth No. 1303**

The Carborundum Company, Electro Minerals Div., Niagara Falls, N.Y. Ferrocarbo briquettes and grain. **Representatives:** J. S. Imirie, G. R. Rayner, Jr., D. F. Profant. **Sales Representatives:** Kerchner, Marshall & Co., Pittsburgh, Miller & Company, Chicago. **Booth No. 1942**

Carrier Conveyor Corp., Louisville, Ky. Natural frequency vibrating conveyors and processing equipment. **Booths Nos. 1341-1343**

Carver Foundry Products, Muscatine, Iowa. Core shooters, CO_2 binder, CO_2 gassing apparatus, sand mixers. **Representatives:** Roy J. Carver, W. Phillips, M. Hurlbut **Booth No. 1318**

Central Foundry Div., General Motors Corp., Saginaw, Michigan. Armasteel, malleable and gray iron castings. **Booth No. 2108**

Centrifugal Casting Machine Co., Tulsa, Okla. Horizontal and vertical centrifugal casting machines, vacuum degassers. **Representatives:** E. L. Pangborn, Nathan Janco, Dan Pendergast, C. W. Leuders, W. E. McCullough **Booth No. 302**

Cerro de Pasco Corp., New York 22, N. Y. Low-temperature melting, nonshrinking pattern metals. **Representatives:** O. J. Seeds, R. S. Darnell, W. C. Smith, J. J. Emmerich, Jos. H. Walter, R. Henning **Booths Nos. 132-134**

Chain Belt Co., Milwaukee 1, Wis. Belt conveyor idlers, conveyor accessories, bearings, pulleys, drag conveyor chains, apron and pan feeders, buckets, bucket elevators. **Representatives:** Fred A. Pampel, J. Roberts, W. Sluyer **Booth No. 110**

Clark Equipment Co., Construction Machinery Div., Benton Harbor, Mich. Tractor shovels. **Representatives:** C. E. Killebrew, C. G. Kennedy, D. A. Burnett, M. O. Nystrom, P. G. Ludwig, N. H. Bartell, Robert Peterson, B. F. Reach, George Japhet **Booths Nos. 1340-1439**

Clayton Sherman Abrasive Co., Detroit 10, Mich. Shot and grit. **Representative:** Norman K. Kann **Booth No. 1829**

Clearfield Machine Co., Clearfield, Pa. Sand mixers. **Representatives:** W. E. McMurray, R. K. Quigley, S. R. Rapp **Booth No. 703**

Cleco Div., Reed Roller Bit Co., Houston, Texas. Pneumatic grinders, sand rammers, chippers and scalers, drills, air line accessories. **Booths Nos. 709-711**

Cleveland Flux Co., Cleveland 13 Ohio. Foundry fluxes. **Representatives:** Clifford B. Cornell, Frank P. Volgstadt, John Paal, Jr., Chris T. Jensen, Ronald C. Jensen, L. Arthur Dawson, Leroy G. VanStone, William F. Hunsche, Ed. J. Goehringer, Julia L. Boss, Earl A. Swenson, Tom Stanley **Booths Nos. 1728-1730**

Cleveland Metal Abrasive Co., Cleveland 3, Ohio. Metal abrasives. Steel, chilled iron, normalized shot, grit. **Representatives:** O. S. Stewart, R. J. Stewart, J. J. Raleigh, J. M. McKenzie, Geo. C. Stevens, T. R. Vogt, Joe L. Wuerstner, Jack Neary, Howard Kulas **Booth No. 1842**

Cleveland Vibrator Co., Cleveland 13, Ohio. Pneumatic and electric vibrators. **Representatives:** J. E. Becker, Gilbert R. Stocum, Randolph L. Ruhley, Jack Becker, Frank Foy, L. P. Metesser, Lou Shepard, Kenneth G. Becker **Booth No. 423**

Climax Molybdenum Co., New York 36, N. Y. Molybdenum products. **Representatives:** R. E. Warriner, R. S. Archer, J. Z. Briggs, N. L. Deuble, L. E. Ekholm, B. H. Danziger, T. D. Parker, R. W. Cullen, D. Wilner, V. H. Patterson, E. K. Leavenworth, V. A. Crosby, H. C. Geittman, D. C. McVey, J. P. McGuire, J. W. Goth, T. E. Norman, A. J. Herzig, J. F. Robb, J. E. Wilson, D. V. Doane, W. G. Scholz, G. A. Timmons **Booths Nos. 602-701**

Colonial Metals Co., Columbia, Pa. Bronze, brass and aluminum ingots **Booth No. 336**

Corning Glass Works, Corning, New York. Glass mold precision casting process. **Representatives:** J. C. Crispino, J. D. Pisula, E. C. Leibig, John Grant, K. D. Scheffer, H. E. Bahr, F. E. Rector **Booth No. 1912**

Corn Products Sales Co., New York 4, N.Y. Binders. **Representatives:** F. Faller, A. H. Kreischer, P. Moreau, C. Lourich, E. W. Schmitt, D. E. Linn, James H. Wehan, G. Adie, A. Thumler, E. Fee, V. Craig, A. A. Harden, J. F. Herman **Booths Nos. 702-801**

C & S Products Co., Inc., Detroit 27, Mich. Shell molding and coremaking, shell mold consultant. **Representatives:** Gerald A. Conger, Rodney L. Sonnenberg, Chris A. Zanison **Booth No. 1944-B**

Davenport Machine & Foundry Co., Davenport, Iowa. Molding units, automatic or manual; core shooters, molding machines. **Representatives:** Dr. Geo. Braunlich, H. E. Fellows, J. W. Higley, W. A. Geisler, R. A. Rowland, Joe Weimerskirch **Booths Nos. 1945-1947**

Davey Compressor Co., Kent, Ohio. Rotary tank mounted air compressors—two, three, and five horsepower. **Representatives:** Joe Myers, Larry Darling, Carl Sellman **Booth No. 307**

Dayton Oil Co., Dayton 2, Ohio. Core oils, core and mold washes, binder and core paste. **Representatives:** L. S. King, J. C. Eismann, J. G. Freeman, E. J. James, B. S. Fearing, E. E. Hook, D. C. Brainard, L. F. Stephenson **Booth No. 1001**

Debevoise-Anderson Company (Inc.), New York 17, N. Y. Pig iron, coke, limestone, alloys. **Representatives:** Nils Anderson, Jr., Allan M. Johnson, J. H. Orrok, Robert J. Talton, G. H. Pool, O. V. Warner, C. H. Gillespie, R. G. Furst **Booths Nos. 236-337**

Delhi Foundry Sand Co., Cincinnati 33, Ohio. Foundry sands and fluorspar. **Representatives:** H. F. McVay, Mrs. H. F. McVay, James E. Reedy, William R. Oakley **Booth No. 1114**

Delta Oil Products Co., Milwaukee 9, Wisc. Core and mold washes for all types of metal castings. Sand additives, release agents, parting compounds, core oil, liquid resins and dry binders. **Representatives:** Joseph A. Gitzen, Ronald P. Klumb, S. W. Hinrichs, E. A. Rathlesberger, John J. Lee, Vernon D. Gornik, Walter Napp. **Booth No. 1525**

Wm. Demmler & Bros., Kewanee, Ill. Core blowing machines, mold blowing machines, core box vents. **Booth No. 1425**

Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich. Electric metal-melting furnaces. **Representatives:** B. W. Schafer, H. F. Arndt, Lynn Brooks, Ken Benson, Joe Prygocki **Booth No. 1920**

Harry W. Dietert Co., Detroit 4, Mich. Sand testing equipment. Automatic controls for tempering, processing and distribution of foundry sand. **Representatives:** Jess Toth, Victor Rowell, Randolph Dietert, Douglas Buss, Howard Jameson, Alex Graham, John McGarry, Mrs. D. L. Buss **Booth No. 1527**

Dike-O-Seal, Inc., Chicago 36, Ill. Continuous core box seals, erosion resistant wear pads. **Representatives:** Richard L. Olson, M. Toman, E. Cleland, R. M. Ling **Booth No. 309**

Joseph Dixon Crucible Co., Jersey City 3, N. J. Crucibles, refractories, graphites, paints and pencils. **Representatives:** L. A. Behrendt, H. E. Ehlers,

(Continued on back of map, Page 81)

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Ralph Rathyen, R. C. Brock, Ray Rathyen, Joe Linehan, Jr., C. J. Elson, A. C. Schmid, V. C. Stocker, K. L. Harrington, H. A. Coady, P. H. Reader, K. L. McRae, H. Eichwald, W. M. Robinson, J. R. Hale, R. B. Beam, R. E. Harris, R. E. Goodfriend **Booth No. 222**

Dodge Steel Co., Philadelphia 35, Pa. Universal Blowplate. **Representatives:** Arthur S. Briethaupt, Morris E. Neeley, John H. Beeler, Robert J. Baker, Henry J. Kelly **Booth No. 201**

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Eastern Clay Products Dept., International Minerals & Chemicals Corp., Chicago 6, Ill. Pressure molding bonds and equipment for green sand and CO_2 molding **Booths Nos. 1822-1826**

Eastman Kodak Co., X-ray Div., Rochester 4, N. Y. X-ray films, processing chemicals and accessories. **Representatives:** William Kiehle, Royal Tobey, Ralph Turner, Alford Kennedy, Harry Lumbard, Carl Maier, Robert Morrison **Booth No. 401**

Eclipse Fuel Engineering Co., Rockford, Ill. Aluminum melting furnaces, automatic loading devices, gas and/or oil combustion equipment. **Representatives:** J. H. Sands, R. H. Hayden, A. D. Wilcox, H. Hoge, D. A. Campbell, G. Anderson, Cy Capka, J. M. Quick, A. N. Mason, L. B. Maximon **Booth No. 910**

Electro Metallurgical Company, Div. of Union Carbide and Carbon Corp., New York 17, N. Y. Ferroalloys and metals, ferroalloy briquets. **Representatives:** R. A. Aeberly, E. A. Brandler, R. A. Clark, J. F. Collins, J. M. Crane, W. H. Ferguson, L. F. Granger, F. W. Hanson, J. O. Hastings, J. G. Holmes, V. P. Jeannot, J. N. Ludwig, Jr., R. D. Malin, R. T. Miller, P. L. Reiber, O. G. Specht, Jr., F. A. Stephens, H. J. Pfeifer **Booths Nos. 1635-1643**

Electro Refractories & Abrasives Corp., Buffalo 19, N. Y. Crucibles, vitrified and resinoid grinding wheels, super refractories and high temperature cements. **Representatives:** Carl F. Leitten, R. Clyde Wolfgong, George B. Mitchie, Carl A. Asher, Kenneth S. Cowlin, Milton H. Berns, William J. Eames, John Matchulat, Howard D. Leitten, Harold R. Smartt, Arthur D. Stover, John Hume, Earl A. Solomon, Lawrence Sharkey, Robert J. Langan, Peter Antones **Booth No. 1426**

Charles Engelhard, Inc., East Newark, N. J. Thermocouples, pyrometers, gas analysis equipment, ceramics, resistance thermometer bulbs. **Representatives:** E. P. Anderson, B. Brodsky, J. H. Oetjen, G. R. Briechle, F. D. Kruty, O. Kunze, R. M. Nelson, C. H. Schmidt **Booth No. 2003**

Exomet, Inc., Conneaut, Ohio. Exothermic riser and mold compounds, Insulating sleeves, carbon free hot and custom alloys. **Representatives:** Michael Bock II, Erich C. Pietsch, Donald E. Wyman, William L. Garner, A. H. Colwell, Donald E. Wiley, Paul H. Edwardsen **Booth No. 332**

Fabrecka Products Company, Boston 24, Mass. Pads for absorption of impact shock, vibration and noise. **Representatives:** Ralph R. Howard, Charles B. Wood, John C. Wiles, A. W. McKaig, D. J. Calder, Fred A. Hofmann **Booth No. 1428**

Fanner Manufacturing Co., Cleveland 11, Ohio. Chaplets, chills, scab nails. **Representatives:** Thomas E. Butz, Norman J. Henke, James O'Brien, A. R. St. Clair, Emil G. Schmidt, A. S. Monas, A. Kinkade, Henry Bechtel, Louis Pastor, Walter Brisbois, Fred McGee, Myron Doelman, William Hoffman **Booth No. 417**

Federal Foundry Supply Co., Cleveland 5, Ohio. Core blowers and mold blowers, foundry facings and supplies. **Representatives:** Elmer E. Ditty, L. H. Heyl, T. J. Brown, George E. Miller, R. H. Burnell, Henry Herbruggen **Booths Nos. 1348-1346**

Federated Metals Div., American Smelting and Refining Co., New York 5, N. Y. Non-ferrous casting alloys, brass, bronze, aluminum, magnesium. **Representatives:** Edgar L. Newhouse, III, Emile L. Rimbault, Jr., Aubrey M. Callis, John W. Kelin, Allan Nichamin, Donald L. Lavelle, Robert A. Colton, Joseph D. Allen, Herman L. Smith, William Kuyper, Bernard L. Meredith, A. E. Riccardo, Edward J. Baker, Douglas H. Wheeler, Martin Gersh, Edward R. Bergin, Lewis Hoffman, A. A. Hochrein, Leonard A. Bonner, Spencer A. Schilling, Daniel Neumann, Robert L. Philion, John L. Griffith, Robert F. Maturin, Robert G. Peat, J. Harry Lambert, Jr., Ben J. Lippert, C. R. Kenner, Robert S. Wahl, Carl J. Gross, John L. Kammermeyer, Earl W. Marks, J. Douglas Magee **Booths Nos. 903-909**

Foundry, Cleveland 13, Ohio. Foundry magazine. **Representatives:** J. F. Ahrens, Dolores Brant, Edwin Bremer, Bettie Cook, G. R. Ebersole, Jeanne Franklin, D. D. Gibbs, W. G. Gude, Virginia Harms, G. O. Hays, R. H. Herrmann, L. R. Hetke, R. C. Jaenke, A. W. Johansen, D. C. Kiefer, Mary Jane Kimpel, A. L. Klingeman, J. C. Miske, K. L. Mountain, J. L. Ozanne, B. K. Price, G. A. Pope, H. L. Richey, E. F. Ross, F. G. Steinebach, Virginia Taylor, E. H. Thomas **Booth No. 1521**

Foundry Educational Foundation, Cleveland 13, Ohio. **Representatives:** Edward J. Walsh, Frank Traviglia, Jr. **Booths Nos. 105-107**

Foundry Equipment Co., Cleveland 13, Ohio. Core and mold ovens, heat-treat ovens, furnaces. **Representatives:** C. A. Barnett, J. M. Beyvl, C. H. Barnett, C. I. Ritchie, R. W. Wagner, R. M. Serota, J. D. Russell, W. A. Miner, W. W. Drissen, M. L. Doelman, R. F. Frings, D. G. Tekamp, F. W. Fuller, R. J. Brandt, E. C. Silver, J. G. Risney, O. H. Rosentreter, E. C. Troy, H. H. Updegraff, W. L. Kammerer **Booths Nos. 1415-17-19**

Foundry Equipment Manufacturers Association, Inc., Washington 5, D. C. **Representative:** C. R. Heller **Booth No. 1104**

Foundry Facings Manufacturers Association, Pittsburgh 19, Pa. **Booth No. 2013**

Foundry Flask & Equipment Co., Northville, Mich. Steel foundry flasks, pins and bushings. **Representatives:** P. H. Kitzens, S. O. Warner, A. M. Weber, H. K. Weber, J. A. Weber, J. W. Weber **Booth No. 2114**

Foundry Services, Inc., Columbus 7, Ohio. Fluxes, deoxidizers, degassers, mold-die dressings, exothermic compounds, CO_2 process. **Representatives:** E. Weiss, Dr. K. Strauss, F. Eastwood, J. E. Gotheridge, G. R. Witt, Don Kreuder, Roy Kress, J. C. Correll, L. T. Johnson, H. D. Shepard, V. R. Fulthorpe, Miss M. K. Dershem **Booths Nos. 1906-1908**

Fox Grinders, Inc., Pittsburgh 22, Pa. High speed swing frame grinders, stand grinders and cut-off machines. **Representatives:** J. G. Bair, J. T. Shull, J. H. O'Sullivan, J. F. Chamberlain, E. B. O'Connor, W. B. Ford **Booth No. 1112**

The Foxboro Co., Foxboro, Mass. Complete recording and automatic control instrumentation for foundry processes. **Representatives:** S. C. Horn, R. C. Tamm, J. W. Peirce, J. W. Gordon, A. R. Hicks, H. L. Hinkley, R. H. Sweet, C. L. Williams **Booth No. 906**

Freeman Supply Co., Toledo 5, Ohio. Pattern shop and foundry supplies and equipment, mahogany and pine pattern lumber. **Representatives:** G. R. Rusk, Wm. J. Barber, Wm. R. Bates, C. Bush, W. W. Camp, D. Catron, Wm. Dashiel, Barney Gates, F. J. Grosch, Ott Haefner, C. Kershaw, H. A. Kottman, Jack Lambert, R. L. Miller, W. M. Sims, F. H. Trombley, Carl Waite **Booths Nos. 1328 and 1330**

General Electric Co., Pittsfield, Mass. Resins and silicones for shell molding and other foundry processes. **Representatives:** E. M. Irish, Jr., J. F. Somers, J. E. Bolt, H. A. Taylor, H. F. Ackerman, A. J. Bzdula, J. C. Hudson, L. K. Eber, W. C. Welsh, W. Goss, J. W. Raynolds **Booths Nos. 1924-1926**

General Refractories Co., Philadelphia 2, Pa. Clay, high alumina, silica; basic refractories. **Booth No. 1327**

Girdler Co.-Thermex Div. of National Cylinder Gas Co., Louisville, Ky. Electronic core-baking equipment. **Representatives:** Ralph Benz, Earle C. Call, L. L. Dawson, Gene DeMunbrun, John Frey, John Garger, Bill Hickok, B. R. Hopkins, Nat Levin, Robert Side **Booths Nos. 1329-1331-1333**

Globe Steel Abrasive Co., Mansfield, Ohio. Steel and malleable shot, angular grit, for blast cleaning and peening operations. **Representatives:** W. J. Kann, Jr., J. R. McConnell, H. C. Ripper, A. L. Weil II **Booth No. 1829**

Daniel Goff Company, Inc., Jesse S. Morie & Son, Inc., Mauricetown, N. J. Producers and shippers of industrial and foundry sands and clay. **Booth No. 103**

Gray Iron Founders' Society, Inc., Cleveland 14, Ohio. National trade association for Gray Iron Foundry Industry. **Representatives:** Donald H. Workman, Charles F. Walton, E. Harold Mitchell **Booths Nos. 131-133**

Great Lakes Carbon Corp., Electrode Div., New York, N. Y., Missouri Coke & Chemical Div., St. Louis, Mo. Electrodes, foundry cokes, carbon and graphite products. **Booth No. 1128**

Great Lakes Foundry Sand Co., Detroit 26, Mich. Silica, lake and bank sands, coke, clays, refractories and abrasives. **Representatives:** R. J. Gronenweth, R. W. Muhlitner, W. H. Paddison, Alex Avram, Fred Wygal, Rob't. Cleland, W. D. Lewis, O. A. Monrad, G. H. Barnes, J. G. Mendenhall **Booth No. 1812**

A. P. Green Fire Brick Co., Mexico, Mo. Refractories. **Representatives:** R. W. Fross, P. S. Johnston, R. A. Witschey, O. H. Read, H. L. Beynon, D. W. Wuerthele, John Bing **Booth No. 207**

Samuel Greenfield Co., Inc., Buffalo 12, N. Y. Smelters and refiners of brass, bronze and aluminum ingot. **Representatives:** Gordon DeBoskey, Stephen Stilwell, Edgar Burgess, Jr., Arnold J. Martin, Leonard Greenfield, Jerry Wolfish, Frank Clark **Booth No. 229**

Grindle Div. of C. O. Bartlett & Snow Co., Harvey, Ill. Cupola and melting equipment. Dust, smoke and fume control. **Representatives:** John Donaldson, J. H. Gougler, H. F. Given, A. R. Anderson **Booths Nos. 1722-1726**

Harbison - Walker Refractories Co., Pittsburgh 22, Pa. Refractories. **Representatives:** Floyd A. Pearce, Loring A. Hannah, John S. Marton, William H. Owen, Fred H. Fanning, Jr., John E. O'Reilly, Robert R. Miller, John W. Mull, George E. Koenig, H. Carl Willenbrock, Jr., Leo L. Gill **Booths Nos. 126-128**

E. S. Harman Corp., Chicago 6, Ill. Hot blast cupola. **Representatives:** Charles H. Vennetti, Charles E. Fralick, E. S. Harman, S. Tunder **Booth No. 421**

Benj. Harris & Co., Chicago Heights, Ill. Brass and bronze ingots, copper base alloys. **Representatives:** Nathan Harris, Louis L. Goldman, Joseph S. Harris, Jerome Harris, J. Wayne Harris, Geo. C. DeCook, Wm. J. Kahn, Ray E. Slater, Milton A. Meier, Horace Craig, Sol Kronick **Booth No. 1828**

Harrison Machine Co., Wesleyville, Erie, Pa. Shell mold blowing machines, shell core blowing machines, shell molds. **Representatives:** C. R. Harrison, C. P. Harrison, Dayne H. Patton, Abram C. Deuel. **Booth No. 1321**

Hayleo Controls Corp., Neenah, Wis. Automatic moisture controls, timing, sand level controls and bond feeders. **Representatives:** Nelson Hartley, Marvin Kotvis **Booths Nos. 104-106**

Herman Pneumatic Machine Co., Pittsburgh 22, Pa. Molding machines. **Representatives:** Thomas Kaveny, Jr., Robert G. Kaveny, E. L. Frankenstein, L. V. Rowland, L. L. Johnston, Joseph W. Gibson, John S. Reno, Randolph A. Staples, Ernest N. McWithey, E. A. Swensson **Booths Nos. 1642-1743**

Hewitt-Robins, Inc., Stamford, Conn. Complete belt conveyor systems, industrial rubber products, power transmission equipment. **Booth No. 1738**

modern castings'

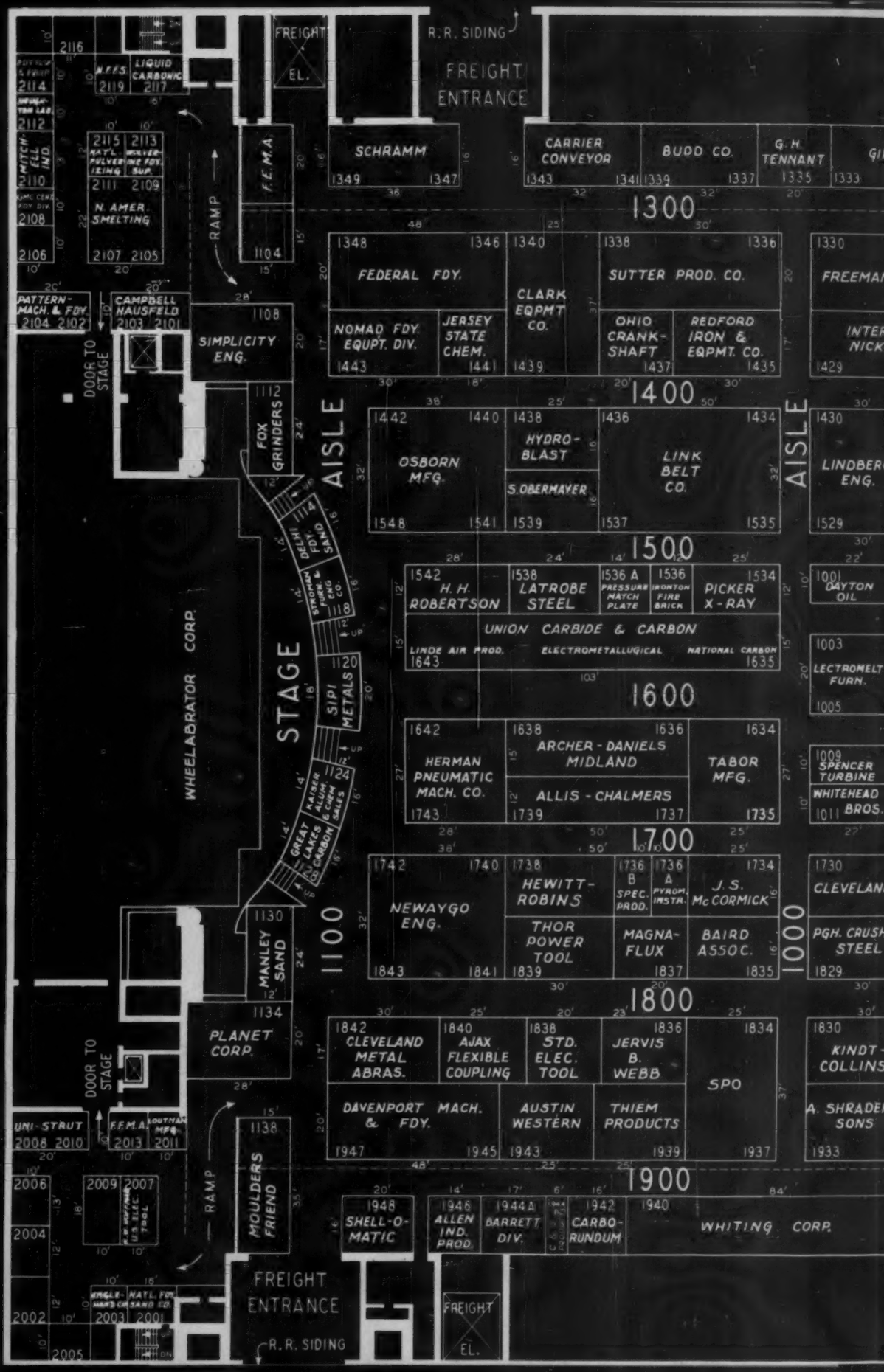
Guide To The Big Show

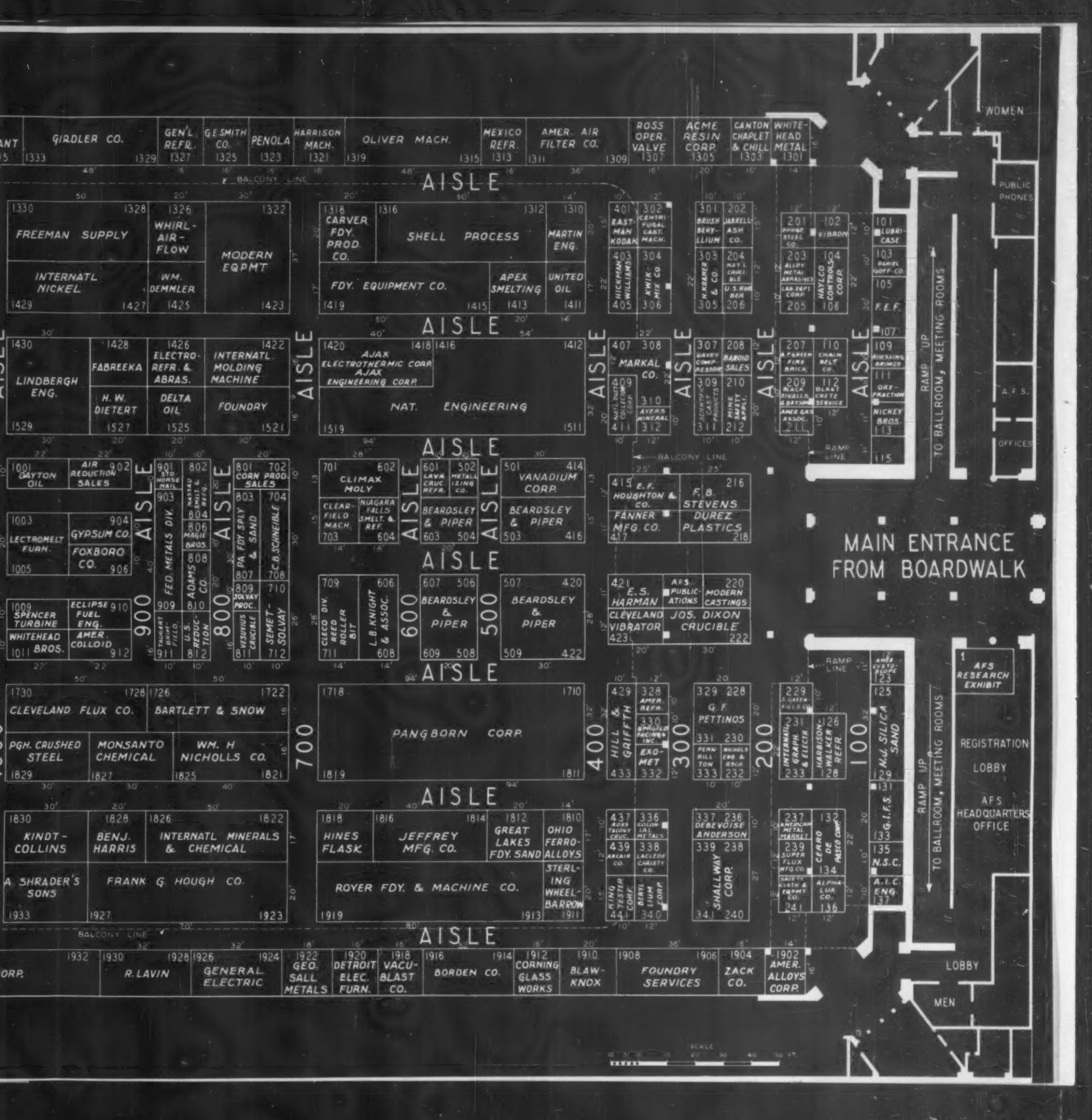
■ This map of the Castings Congress is easy to use. The booths of exhibitors are numbered just as are buildings on a city street.

Aisles are numbered 100 to 1100 crosswise of the hall and 1300 to 1900 lengthwise of the hall. The exhibits are numbered consecutively, corresponding with the aisle or aisles they are on. Thus, National Engineering Company, which is on both aisles 1400 and 1500, has exhibit numbers 1412-1416 and 1511-1519.

The editors of MODERN CASTINGS present this map as one part of a three-part directory service. On adjoining columns is a list of exhibitors and their booth numbers. Following that list is an alphabetical buyers' guide of products by exhibitor and booth location number.

Use this map. It will help you find your way to the specific exhibits and products you came to see. But don't stop there. Millions of dollars have been spent to give you the finest Castings Show of all times. The 240 prime exhibitors have spent millions of dollars for it. They have been working on the show for months. They occupy 92,282 sq ft in this largest convention hall under one roof in the world. Enjoy them.

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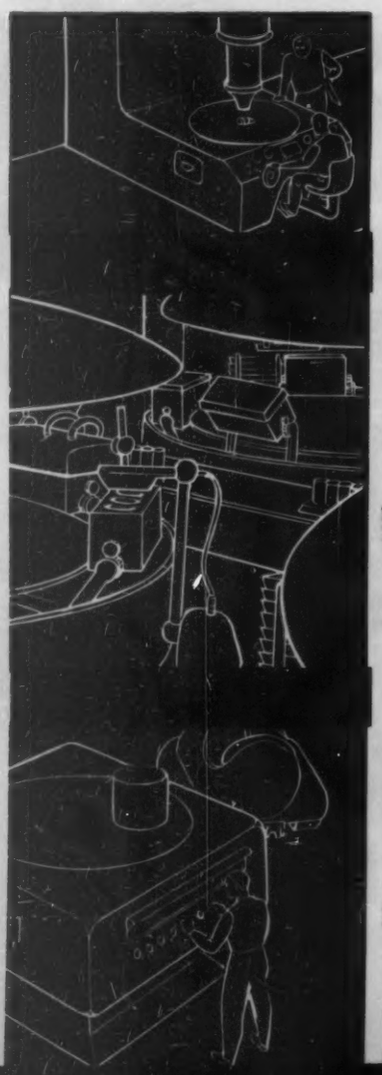
Eastern Clay Products Dept., International Minerals & Chemicals Corp., Chicago 6, Ill. Pressure molding bonds and equipment for green sand and CO_2 molding **Booths Nos. 1822-1826**

Eastman Kodak Co., X-ray Div., Rochester 4, N. Y. X-ray films, processing chemicals and accessories. **Representatives:** William Kiehle, Royal Tobey, Ralph Turner, Alford Kennedy, Harry Lumbard, Carl Maier, Robert Morrison **Booth No. 401**



Eclipse Fuel Engineering Co., Rockford, Ill. Aluminum melting furnaces, automatic loading devices, gas and/or oil combustion equipment. **Representatives:** J. H. Sands, R. H. Hayden, A. D. Wilcox, H. Hoge, D. A. Campbell, G. Anderson, Cy Capka, J. M. Quick, A. N. Mason, L. B. Maximon **Booth No. 910**

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Electro Refractories & Abrasives Corp., Buffalo 19, N. Y. Crucibles, vitrified and resinoid grinding wheels, super refractories and high temperature cements. **Representatives:** Carl F. Leitten, R. Clyde Wolfgong, George B. Mitchie, Carl A. Asher, Kenneth S. Cowlin, Milton H. Berns, William J. Eames, John Matchulat, Howard D. Leitten, Harold R. Smartt, Arthur D. Stover, John Hume, Earl A. Solomon, Lawrence Sharkey, Robert J. Langan, Peter Antones **Booth No. 1426**

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Foundry Equipment Manufacturers Association, Inc., Washington 5, D. C. **Representative:** C. R. Heller **Booth No. 1104**

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Hewitt-Robins, Inc., Stamford, Conn. Complete belt conveyor systems, industrial rubber products, power transmission equipment. **Booth No. 1738**

C. E. Silver, R. T. Donat, S. C. Massari, G. E. Ceebin, H. W. Zimnawoda, John Kauffman, Bill Brolling
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National Foundry Sand Co., Detroit 2, Mich. Refractories, abrasives, shell, CO_2, core, silica sands. **Representatives:** M. B. Giberson, Jr., C. C. Teasel, W. A. Teasel, P. E. Giberson, Lynn Pangborn, John Lee, Al Forte
Booth No. 2001

National Pulverizing Co., Millville, N. J. Silica mold wash, blast sand, dry sand, molding sand, core sand. **Representatives:** Lillian Corson, Edward Shaw, Harold Nichols, Floyd Wheat, Jack Baker, Roland Hoffman, Claire Dodson, Russell Konschak
Booth No. 2115

National Safety Council, Chicago 11, Ill. Training aids and technical publications for industrial safety programs.
Booth No. 135

New Jersey Silica Sand Co., Millville, N. J. Washed and graded silica sands, bank run core and molding sands, milled and mulled molding sands, moisture controlled molding sands, milled and screened gravels, high bond molding sands, sand blast sands, silica flour. **Representatives:** C. R. Wolf, C. F. Wolf, John S. Wolf, C. W. Thompson, George Howell, H. J. Williams, Dan Jones, S. A. Wick, Robert McDonough, Walter Thompson, Jack Moore, Grant Morrison, Walter Gandy, Jr., Emerson Tomlin, Samuel Caldwell, Clifford Walker, Huburt Tomlin, George Herbert, Linwood Thompson, Aida Kessler, Roberta Radcliffe, Mildred Dodson, Frances Kyle, Dan Fenton
Booths Nos. 125-127-129

Newaygo Engineering Co., Newaygo, Mich. Sand handling and conditioning equipment, mold handling, flasks and jackets. **Representatives:** M. J. Bell, R. J. Bell, B. G. Witte, R. Peacock, O. H. Kastens, R. W. Ferguson, J. R. Russo, J. R. Wark, L. J. Gardner, R. J. Brandt, C. H. Palmer, Jr., William Koyle, G. E. Marckres, A. N. Volk, W. Thomas Barr, L. C. Beers
Booths Nos. 1740-1742 and 1841-1843

Niagara Falls Smelting & Refining Div., Continental Copper & Steel Industries, Inc., Buffalo 23, N. Y. Fluxing alloys, special alloys, aluminum alloys, hardening alloys, intermediate alloys, fluxes. **Representatives:** Ernest G. Jarvis, Herbert O. Jarvis, Janet M. Jarvis, B. M. Jarvis, Bertram Bready, R. C. Maurer, Herbert O. Kline, Edwin D. Lucas, Don P. Strauss, Louis G. Tarantino, James D. Kline, Harry J. Weed
Booth No. 604

North American Smelting Co., Wilmington 99, Dela. Copper, aluminum, zinc, lead, tin, and their alloys. **Representatives:** E. J. Ferguson, R. Charrington, J. P. Brull, J. D. Burnham, R. M. Carrigan, T. Goodfellow, J. V. McCarthy, L. A. Mapes, H. R. Palmer, J. L. Pancoast, I. W. Ritchey, Jr., J. E. Smith, F. C. Wheeler, Jr.
Booths Nos. 2105-7-9-11

Wm. H. Nicholls Co., Inc., Richmond Hill, N.Y. Molding machines and foundry equipment. **Representatives:** Wm. H. Nicholls, Walter A. Nicholls, Louis R. Schocken, Edward B. Redhead, Gust Anderson, Robert R. Snow, Swen Anderson, Henry Waldeck, Peter Catalanotto
Booth No. 1821

Nichols Engineering & Research Corp., New York, N. Y. Foundry sand reclamation equipment, Nichols Herreshoff furnaces. **Representative:** William R. Ellengberger
Booth No. 232

Non-Ferrous Founders' Society, Chicago 1, Ill. National organization of copper, aluminum and magnesium-base foundries. **Representatives:** James W. Wolfe, Miss Edith Alexander
Booth No. 2119

S. Obermayer Co., Chicago 8, Ill. Foundry facings, foundry supplies, foundry equipment and refractories. **Representatives:** W. C. Samuels, Dave Gady, J. J. Kilcoyne, A. J. Stephenson, L. J. Jacobs, B. A. Genthe, J. A. Hoffmann, P. A. McArthur, Jack Flynn, O. W. Josephson, L. M. Cohn, F. B. Flynn
Booth No. 1539

Ohio Crankshaft Co., TOCCO Div., Cleveland 5, Ohio. High frequency induction melting equipment. **Representatives:** W. E. Benninghoff, O. R. Berger, C. P. Bidle, V. B. Bullen, J. F. Cachat, R. N. Cummer, W. K. Ginman, R. Kazarian, K. R. Kelly, F. Kowalik, Jr., J. H. Maxim, H. A. Messner, F. V. Mika, W. M. Moore, E. L. Myers, T E. Olson, H. B. Osborn, Jr., W. F. Peschel, G. D. Pfaffman, R. L. Rolf, L. C. Schweitzer, O. S. Spark, K. Stumpf, C. A. Tudbury, A. O. Wood **Booth No. 1437**

Ohio Ferro-Alloys Corp., Canton 2, Ohio. Ferroalloys, ferroalloy briquets. **Representatives:** J. C. Vignos, J. G. Pritz, T. E. Anderson, F. E. Blackburn, D. L. McLeod, E. G. Skarin, Lawrence Gotfredson, V. L. Barbor, W. A. Schirmann
Booth No. 1810

Oliver Machinery Co., Grand Rapids 4, Mich. Pattern shop equipment. **Representatives:** Ralph DeVries, Wm. Lowthian, C. A. Ginter, Robert Jackle, Harold Jackle, George F. Blake, R. T. White, F. W. Kramer, John J. Walsh, C. F. Gorham, A. B. Bemneward, R. Westrate, E. V. McCarthy, Wm. Page, C. J. Hemmer, H. B. Tuthill
Booths Nos. 1315-1317-1319

Orefraction Incorporated, Pittsburgh 8, Pa. Zircon sand and flour **Booth No. 111**

Osborn Manufacturing Co., Cleveland 14, Ohio. Molding machines, core blowers, shell machines and vibrators. **Representatives:** Ted Adams, Clark Alberts, Al Filipic, Ted Hatch, Tom Hyer, Steve Kallas, Len McKibben, Doyle Robbins, Earl B. Smith, Ed Texler, Dick West, John Zaman, Lyndon C. Cole, Edward V. Dowden, Robert W. Ellms, John P. Gaeth, Harry B. Klar, Leon F. Miller, A. E. Rickel, Franklin G. Smith, Norman F. Smith, Gerald R. Welling
Booths Nos. 1440-1442-1541-1548

Pangborn Corp., Hagerstown, Md. Automation in Rotoblast cleaning equipment. Dry and wet dust collectors. **Representatives:** Thomas W. Pangborn, John C. Pangborn, P. J. Potter, Victor F. Stein, Lloyd L. Stouffer, W. O. Vedder, A. J. Buckley, W. I. Gladfelter, G. W. Powell, Jr., A. Lesley Gardner, A. L. Gruber, A. L. Buehler, R. J. Zoller, C. A. Pope, T. T. Alverson, Bruce Artz, Jr., L. W. Wagner, R. W. Gossard, Albert A. Milkie, Thomas O. Weaver, J. C. Peirce, R. E. Donnelly, James E. Martin, O. H. Edwards, D. R. Bair, C. H. McKinsey, R. G. Treglown, Alexander J. Szabo, C. A. Bultman, J. C. Pangborn, Jr., B. H. Marks, L. W. Unger, R. M. Trent, W. F. Jones, A. Van der Lyn, Duanne R. Lamiman, J. K. Schultz, J. D. Wise, Paul P. Butler, Frank Newell, E. C. Gilmour, J. G. Richeson, C. E. Pretzinger, J. H. Connolly, L. A. Stedman, B. R. Artz, Ralph A. Perrin, J. R. Peck, D. B. Cole
Booths Nos. 1710-1718, 1811-1819

Pattern Machine & Foundry Corp., Trenton, N. J. Core box router.
Booths Nos. 2102-2104

Penn-Rillton Co., New York 11, N. Y. Foundry facings, seacoal, pitch. **Representatives:** Hugh A. Stier, H. H. Becker, Ronald Melcher, C. F. Bock.
Booth No. 333

Pennsylvania Foundry Supply & Sand Co., Philadelphia 24, Pa. Equipment and supplies. **Representatives:** S. B. Wentz, H. E. Mandel, J. M. Robb, Jr., F. B. Eliason, L. R. Tierney, Robert Brandt, Dee C. Rose, Harold Ross, S. B. Wentz, Jr., J. O'Brien
Booths Nos. 803-805-807

Penola Oil Co., Detroit 35, Mich. Core oil. **Representatives:** E. G. Gentry, C. L. Lear, C. P. Hanneman, K. S. MacLeod, G. R. Meyers, L. T. Morrow, Leonard Romano **Booth No. 1323**

Penton Publishing Co., Cleveland 13, Ohio. Publications: Foundry, Steel, Machine Design, Automation, New Equipment Digest. **Representatives:** J. F. Ahrens, Ken Bailey, Dolores Brant, Edwin Bremer, Bettie Cook, G. R. Ebersole, Jeanne Franklin, D. D. Gibbs, W. G. Gude, Virginia Harms, R. L. Hartford, G. O. Hays, R. F. Heller, R. H. Herrmann, L. R. Hetke, R. C. Jaenke, A. W. Johansen, D. C. Kiefer, Mary Jane Kimpel, A. L. Klingeman, Guy LaBaw, E. S. Lawson, J. C. Miske, K. L. Mountain, J. L. Ozanne, B. K. Price, G. A. Pope, F. O. Rice, H. L. Richey, E. F. Ross, F. G. Steinebach, S. B. Stewart, L. H. Such, Virginia Taylor, E. H. Thomas, W. J. Verschoor, V. W. Volk, K. A. Zollner **Booth No. 1521**

George F. Pettinos, Inc., Philadelphia 7, Pa. Foundry and industrial sands, graphite, blacking, binders, refractories, parting, silos. **Representatives:** George F. Pettinos, Jr., Louis Dill, Richard C. Newbold, Donald S. Yeomans, Henry R. Williams, Jack P. Kruse, R. Newton Williams, Charles D. Pinkerton, Samuel L. Steinruck, John D. Smith, William A. Gray, III, James V. Pastore, Harold J. McCallum, Russell A. Woods, Charles H. Atkinson
Booths Nos. 228-230-329-331

Picker X-Ray Corp., White Plains, New York. Equipment and accessories for x-ray and gamma radiography.
Booth No. 1534

Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa. Steel and malleable shot, grit. **Representatives:** W. L. Kann, I. A. Diamondstone, Phillip Kaufman, Joseph Dickman **Booth No. 1829**

Planet Corp., Lansing Mich. Design, fabricate and install complete foundry conveyor systems. **Booth No. 1134**

Pressure Match Plate Co., Philadelphia 23, Pa. Pressure cast pattern equipment by plaster process method. **Representatives:** Raymond C. Huntoon, Frederick W. Glabbatz, Charles W. Hervey, James Moore, Jr., Howard Morshead, Jr. **Booth No. 1536A**

Pyrometer Instrument Co., Inc., Bergenfield, N. J. Optical, immersion, surface and indicating pyrometers. **Representatives:** A. Bollerman, Paul V. Bollerman, C. A. Gates, R. A. Gates, L. E. Roher, R. C. Ayers, J. C. Whiddett, A. F. Roberts, C. G. Bollerman
Booth No. 1736A

Redford Iron & Equipment Co., Detroit 23, Mich. Core blowers and accessories. **Representatives:** E. Blendin, H. Childs, D. Piesik, O. Ostermann, O. Blendin, F. Ostermann **Booth No. 1435**

H. H. Robertson Company, Pittsburgh 22, Pa. Permanent colored protected metal walls and roofs, ventilators, insulated walls. **Representatives:** Ev Pierce, Joe Shumaker, Tom Taylor, Martin Mackey, Al Dolan, Jay Waizenhoefer, Harry Mount, Bud McGrath, Don Carlson, Bob Brooks **Booth No. 1542**

Roessing Bronze Co., Pittsburgh 23, Pa. Brass, bronze and aluminum ingots, deoxidizing aluminum. **Representatives:** A. C. Barbour, A. R. Barbour, George R. Acheson, Jr., C. D. Ziel, Harry Shook, William A. Nott, Ernest S. Cricks, Andrew Pilszak, Kenneth Herrod
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Ross Operating Valve Co., Detroit 3, Mich. Operating valves—for control of air, vacuum and low pressure hydraulics. **Representatives:** R. J. Cameron, J. E. Rowe, Jack Neun, Grant Wilcox, Carl Halpin, A. B. Huntington, D. A. DeTirro, Frank Nowack, H. J. Gailey, W. J. Grotewohl, Art Hinz, R. C. MacRae, W. C. Kesselring, Carl Larson, R. A. Reichelt, Russ Niemeier, Walter Sleeman, S. G. Morris, C. H. Hallett, H. P. Barnes, R. G. Pearse, Ed Wenzel, Paul Horbatt, Sanford Ellis, G. M. Pearse, Jr., R. J. Pearson, Earl Richardson, E. A. McQuade, Tom Walsh, Walter Rankin, Dick Rankin, Joe Dalgliesh, R. E. Miles, J. E. Sudduth, H. J. Urquehart, Clarence Tiedman, George Schliecker, Henry M. Wood, N. K. Weslock, George Parker, Allan T. Shepherd, DeWitt H. Skinner, W. Parke Terry
Booth No. 1307

Ross-Tacony Crucible Co., Philadelphia 35, Pa. Carbon-bonded and clay-bonded crucibles and refractories, stopper heads. **Representatives:** H. E. Roberts, C. E. Barrows, J. Heggie, Jr., F. S. Harvath, D. J. Palmer, J. C. Guibert, E. C. Ludwig **Booth No. 437**

Royer Foundry & Machine Co., Kingston, Pa. Sand conditioning and sand handling equipment—stationary and portable. **Representatives:** S. B. Davies, Stanley S. Davies, L. B. Pelesh, Harold Croom, Jacob Seitchek, Bruce S. Davies, Jr., Miss L. V. York
Booths Nos. 1913-1915-1917-1919

Safety Clothing & Equipment Co., Cleveland 3, Ohio. **Gardwell** products for every type of industrial worker. **Representatives:** Lee Debes, Ed Harris, Al Carr, Denny Guion **Booth No. 241**

George Sall Metals Co., Inc., Philadelphia, Pa. Quality non-ferrous metal alloys—aluminum, brass, bronze, zinc. **Representatives:** Frank Daniels, Len Leof, L. Malmud, N. Sladkin, M. Peterson, R. Rich **Booth No. 1922**

Claude B. Schneible Co., Detroit 2, Mich. Dust collectors, hoods, cupola collectors, tanks, pumps, traps. **Representatives:** Harry E. Gravlin, R. Grant Whitehead, Alvin J. Burkis, George C. Schreiber, A. S. Lundy, E. J. Moore, H. J. Schultz, H. E. Pridmore, W. C. Suttles, I. E. Shaer, Tom F. Butler, R. F. Ruggles, W. L. Kammerer, L. C. Beers, R. C. Kane, B. H. Mayer, Neal Smith, J. A. Sharritts, J. A. Sharritts, Jr., E. V. Loughran
Booths Nos. 704-706-708

A. Schrader's Son Div., Brooklyn 17, N. Y. Air control products, pneumatic machine controls, air valves and cylinders. **Representatives:** F. L. Engstrom, J. J. Meister, F. H. Churchwell, E. J. Schan, L. R. Doty, R. E. Jorgensen, K. P. Hall, R. E. Olsen
Booth No. 1933

Schramm, Inc., West Chester, Pa. Air compressors. **Representatives:** G. B. Comfort, G. A. Nabb, Wm. A. Frantz, Don W. Sieggried, F. E. Weikel, J. F. McTeague, R. D. O'Hanlon, Eugene Gilroy, R. B. Rowland
Booths Nos. 1347-1349

Scientific Cast Products Corp., Cleveland 3, Ohio, and Chicago 12, Ill., pressure cast matchplates, cope and drag plates, core boxes-driers. **Representatives:** W. A. Hilberer, O. H. Harer, James Dittrich **Booth No. 311**

Semet-Solvay Div., Allied Chemical & Dye Corp., New York 6, N. Y. Coke.
Booths Nos. 710-712

Shalco Engineering Corp., Shallway Corp., Connellsville, Pa. Shell molding equipment and supplies, shell core equipment and supplies, shell sand coating muller. **Representatives:** John B. Shallenberger, Wm. J. White, Richard C. Yetter, Ron Parker, Wm. Gallagher, Glenn S. Marks, Charles Lay, Ed Penn, Bruce Markey, Harvey Black, John Elias, Herbert Von Wolfe, Frank K. Shallenberger, Forest Boucher
Booths Nos. 238-240-339-341

Shell-O-Matic, Inc., Irvington 11, N. J. Automatic shell molding machines.
Booth No. 1948

Shell Process Inc., Chicopee, Mass. Shell molding, shell core blowing, equipment and standard accessories. **Representatives:** Earl W. Jahn, Ray Olson, John Dwyer, Mac Petrie, John Nineman **Booths Nos. 1312-1314-1316**

Simplicity Engineering Co., Durand, Mich. Foundry shakeouts and sand conditioners, Os-A-Veyor feeders and vibrating conveyors. **Representatives:** R. C. Johnson, J. Powlison, E. L. A. Whit-

DIRECTORY OF EXHIBITORS AND PRODUCTS

aker, R. Westcott, R. A. Aleshire, F. D. Barber, J. P. Dale, A. Darcus, A. C. M. DeSoto, M. H. Dodge **Booth No. 1108**

Sipi Metals Corp., Chicago 22, Ill. Nonferrous alloys, ingot, shot. **Representatives:** M. E. Lippert, L. H. Strauss, E. M. Pinsof, W. O. Bosserman, Frank Mytnik **Booth No. 1120**

G. E. Smith, Inc., Pittsburgh 16, Pa. Kold-Set binder. **Representatives:** G. E. Smith, F. H. Dettore, George Kiolicas, A. H. "Doc" Ciaglia, C. M. Smith **Booth No. 1325**

Solvay Process Div., Allied Chemical & Dye Corp., New York 6, N. Y. Dense soda ash, alkalies, chemicals. **Representatives:** H. R. Stoothoff, F. E. Bates, R. C. Wallace, P. Gulbrandsen **Booth No. 809**

Specialty Products Co., Jersey City, N. J. Low gas core binders, liquid binders for shell molds and regular cores. **Representatives:** S. J. Singer, P. G. Hendrix **Booth No. 1736-B**

Spencer Turbine Co., Hartford 6, Conn. Industrial vacuum cleaners and turbo compressors. **Representatives:** Norm S. Barnes, R. A. Brackett, R. W. Richardson, R. A. Brackett, I. H. Geiger, R. Webber, R. Graff, A. B. Bates, S. Douglas **Booth No. 1009**

SPO, INC., Cleveland 25, Ohio. Molding machines, core machines, briquetting presses, core grinders, vibrators. **Booths Nos. 1834-1937**

Springfield Facing, Inc., Harrison, N. J. Foundry facings, foundry supplies, Detroit electric furnaces, Buckeye tools, Charcoal. **Representatives:** William Lawson, J. Larrabee, J. Marini, A. S. Wright, Whitney Russell, P. F. Bullion **Booth No. 330**

Standard Electrical Tool Co., Cincinnati 4, Ohio. Infinitely variable speed snagging grinders, dust collectors. GRIND-AirRester (combination grinder and dust collector) **Representatives:** W. A. Ferguson, R. A. Huhn, J. J. Klopp, V. R. Lagaly, J. J. Falls, W. J. Holtmeier, A. J. Riley, J. Reid, R. J. Ferguson, R. W. Pattison, A. J. Flohr, D. K. Calhoun, E. G. Gauspohl **Booth No. 1838**

Standard Horse Nail Corp., New Brighton, Pa. "Koolhead" foundry chill nails, spider chills and "Stanho" steel products. **Representatives:** G. Blair Sheers, Raymond Cox **Booth No. 901**

Steel, Cleveland 13, Ohio. Steel magazine. **Representatives:** G. R. Ebersole, G. O. Hays, R. C. Jaenke, D. C. Kiefer, Guy LaBaw, B. K. Price, E. F. Ross, F. G. Steinebach, S. B. Stewart, I. H. Such, W. J. Verschoor, K. A. Zollner **Booth No. 1521**

Steel Shot Producers, Inc., Butler, Pa. Tru-Steel shot for blast cleaning and peening. **Representative:** R. W. Isaacson **Booth No. 1829**

Sterling Wheelbarrow Co., Milwaukee 14, Wis. Rolled steel flasks, bottom boards, pins, bushings, foundry trucks, wheelbarrows. **Representatives:** C. A. Gehrman, H. A. Frank, W. J. Mueller, J. P. Baukus, W. J. Holehouse, H. E. Voit, R. C. Nelsen, F. J. Felsburg, L. T. Crosby, C. W. Gullickson, G. F. Goetsch, F. H. Dorndorfer, S. H. Smith, D. J. Pendergast. **Booth No. 1911**

Frederic B. Stevens, Inc., Detroit 16, Mich. Foundry facings, foundry supplies, and equipment. **Booth No. 216**

Stroman Furnace & Engineering Co., Div. of Petersen Oven Co., Franklin Park, Ill. Metal melting furnaces for ferrous and non-ferrous metals—gas-oil fired. **Representatives:** J. L. Stroman, J. C. Smith, C. R. Johansen, J. P. Hoehling, Jr. **Booth No. 1118**

Superflux Mfg. Co., Allen Park 10, Mich. Cupola flux. **Representative:** Horace Bringhurst **Booth No. 239**

Sutter Products Co., Dearborn 7, Mich. Core blowers, core draw machines, shell core and shell molding equipment. **Representatives:** R. H. Sutter, George Buchanan, Nick Popa, Adam Kafka, Harry Oldham, Al Kluge, William Sutter, John Campbell, Tom LeMay, Harold Plummer **Booths Nos. 1336-1338**

Tabor Manufacturing Co., Div. of Turbo Machine Co., Lansdale, Pa. Molding **Tabor Manufacturing Co.,** Div. of Turbo Machine Co., Lansdale, Pa. Molding machines, abrasive cutoff machines, vibrators. **Representatives:** L. Schierenbeck, Dexter Schierenbeck, R. Myers, Robert F. Lawrence, J. W. Stuart, R. H. Wiehsner, A. B. Eastwood, E. L. Tuck, J. F. McMullin, A. C. Eastwood, Harry H. Reich, Harry C. Reich, P. J. Shire, George Liff, John Waddington, Carol Smith, A. F. Vasko **Booths Nos. 1634-1735**

Taggart Brimfield Co., Hammonton, N. J. Foundry sands and gravel. **Representatives:** William W. Brimfield, Ernest C. Brimfield, Harold J. Brimfield, Alfred V. Brimfield, Alfred P. Brimfield, Richard B. Brimfield, William D. Daugherty, Edward M. Taggart, E. H. Daugherty, Edward H. Brimfield **Booth No. 911**

G. H. Tennant Co., Minneapolis 11, Minn. Foundry sweepers (vacuum equipped), industrial floor maintenance machines. **Representatives:** O. C. Hognander, G. D. Billings, R. L. Lindboe, W. L. Wiegman, J. H. Kelley, R. C. Crickmer, P. A. Manfra, W. H. Emerson, R. T. Gault, A. H. Jackson, R. H. Trost, H. H. Herman, J. P. Ryan, M. H. Laikola **Booth No. 1335**

Thiem Products, Inc., Milwaukee 14, Wis. Core and mold coatings, core oils and binders, sand additives. **Representatives:** Angelo Paoli, Bill Ellison, Bob Epps, Jack Clark, Peter Barry, Paul Barry, Bill Whittingham, Herb Klopf, Carl Schwetz, Darold W. Thiem, Ralph G. Mensch **Booth No. 1939**

Thor Power Tool Co., Aurora, Ill. Thor portable power tools, air, universal electric, high frequency electric. **Representatives:** W. A. Nugent, J. A. Hill, G. H. DuSell, J. F. Corkery, G. A. Thoma, M. A. Sorenson, W. J. McGraw, J. L. MacDonald, J. T. Wity, C. G. Campbell, J. P. Fletcher, M. M. McBride **Booth No. 1839**

Unistrut Products Co., Chicago 7, Ill. Unistrut adjustable metal framing and mechanical supports, racks, shelving, adjustable partitions, movable walls, foundry pattern racks. **Representatives:** C. Elsasser, Jr., G. A. Hagoplan, E. H. Salisbury, C. T. Walas, W. G. Beaumont **Booths Nos. 2008-2010**

United Oil Mfg. Company, Erie, Pa. Linbond, Korglaze, Liquid Parting, Korbond, Top-bond, Aqua-set, Aqua-bond, Unilease. **Representatives:** H. L. Gebhardt, F. C. Gebhardt, James F. Pace, Dean K. Johnson, Albert Tellis, J. S. Schram **Booth No. 1411**

United States Electrical Tool Co., Cincinnati 23, Ohio. Portable electric tools, grinders, buffers. **Representatives:** Gilbert F. Biecker, George D. Behlen, Carl Hunsicker, Anthony J. Hartig, Jr., Paul D. Schneider, R. Nelson, J. K. Bousum, L. E. Dubuque, Wm. A. Smith, Stanley Sheppard, A. W. Fox, Frank Robertson **Booth No. 2007**

U. S. Gypsum Co., Chicago 6, Ill. Precision casting plasters, permeable and pressure metal casting plasters, plaster and plastic pattern making materials. **Representatives:** M. K. Young, H. W. Davis, R. Hamilton, H. C. Sechler, R. Pearson, R. Murphy **Booth No. 904**

U. S. Reduction Co., East Chicago, Indiana. Aluminum ingot and de-oxidizing shapes. **Representatives:** R. W. Tompkins, R. S. Neufeld, E. A. Heilbronn, R. P. Dunn, G. L. Armstrong, L. F. Wind **Booth No. 812**

United States Rubber Co., New York 20, N. Y. US foundry giant conveyor belts, US grinding wheels, US searle sleeves. **Representatives:** H. E. Dadson, F. J. McManimon, H. B. Allison, W. F. Pletcher, O. E. Snyder, R. R. Stoffer, W. A. Kesterke, W. N. Schneider, C. C. Parker, H. E. Pruner, R. E. Spoerl, A. W. Moyer **Booth No. 206**

Vacu-Blast Company, Inc., Belmont, California. Waffle floor Vacu-blast room, Vacu-veyor sand handling, Vacublaster. **Representatives:** Wm. H. Mead, R. H. Walpole, Jr., B. B. Jarl, Geo. Thomas, L. T. D. Berg, Austin Chamberlain **Booth No. 1918**

Vanadium Corporation of America, New York 17, N. Y. Ferro alloys, metals and chemicals. **Representatives:** W. C. Keeley, Gustav Laub, G. C. Floyd, Jerome Strauss, H. E. Barnum, C. G. deLaval, J. J. Farrell, R. H. Filsinger, F. F. Franklin, J. B. Girdler, J. J. Green, D. A. Hackett, R. F. Hancock, H. W. Hanes, Arthur Herbener, G. W. Johnson, W. J. Killian, L. W. Lewis, G. S. Linberg, J. H. McGraw, T. W. Merrill, H. E. Orr, H. S. Schaufus, E. W. Sniffen **Booths Nos. 414-501**

Vesuvius Crucible Co., Swissvale 18, Pa. Graphite refractories, crucibles, bowls, ladle liners, base blocks, stopper heads. **Representatives:** Alan Arensberg, G. C. Barclay, R. E. Farrell, A. C. Hauck, R. J. Haworth, Ted Harley, K. D. Hoke, Harry Hampe, H. J. Kumer, J. V. McCarthy, L. F. McConnell, C. B. Murton, H. Oswald, H. C. Sorenson, R. H. Stone **Booth No. 811**

Vibron Div., Burgess Corp., Cleveland 11, Ohio. Recoiless rammers, quiet and impacting vibrators, vibratory conveyors, automation engineering. **Representatives:** W. C. Burgess, Jr., J. S. Beckerman, W. L. Gerlach, H. Zager **Booth No. 102**

Jervis B. Webb Co., Detroit 4, Mich. Foundry mold conveyors, sand handling equipment, casting cooling conveyors, power and free conveyors, span master cranes. **Representatives:** Jervis C. Webb, Edward C. McCaul, George Webb, Carl Theobald, Don C. Green, Edward Flannery, Frank Beatch, Lee Gannon, Leonard Hurst, John Rumsey **Booth No. 1836**

Westover Corporation, Milwaukee 10, Wis. Nomad mold conveying equipment, sand preparation and distribution systems. **Representatives:** C. E. Westover, J. A. Westover, O. H. Kraft, E. H. Schubert, H. L. Atwell, J. A. Kasprosk **Booth No. 1443**

Wheelabrator Corporation, Mishawaka, Indiana. "Super Tumblast", blast cleaning equipment. **Booth No. Stage**

Whirl-Air-Flow Corp., Chicago 39, Ill. Pneumatic conveyor systems. **Representatives:** George Anselman, Gilbert Babcock, Jack Cleveland, Ray Pence, George Wilk **Booth No. 1326**

Whitehead Brothers Co., New York 11, N. Y. Industrial sands and foundry materials: Lyquaflour, Lyquagrip, Joint Seal. **Representatives:** A. Y. Gregory, F. B. Clarke, C. B. Somers, B. P. Wallace, B. E. Beldin, W. R. Slater, W. C. Naughton, W. B. Sattler, W. S. Duryea, Lee Hutson, G. T. Meyer, R. H. Olmsted, R. W. Somers, H. E. Lundgren, W. E. Decker, A. J. McBride, Benjamin Fuller, J. F. Loertscher, R. J. Maddison, C. C. McKay, J. H. Whitehead **Booth No. 1011**

Whitehead Metal Products Co., Inc., New York 14, N. Y. Complete line of foundry alloys. **Representatives:** John J. Fitzgibbon, Joseph Nixon, Frank D. Norwich, Hunt S. Patterson, John A. Whelan, Richard Williams, James G. Gaffney **Booth No. 1301**

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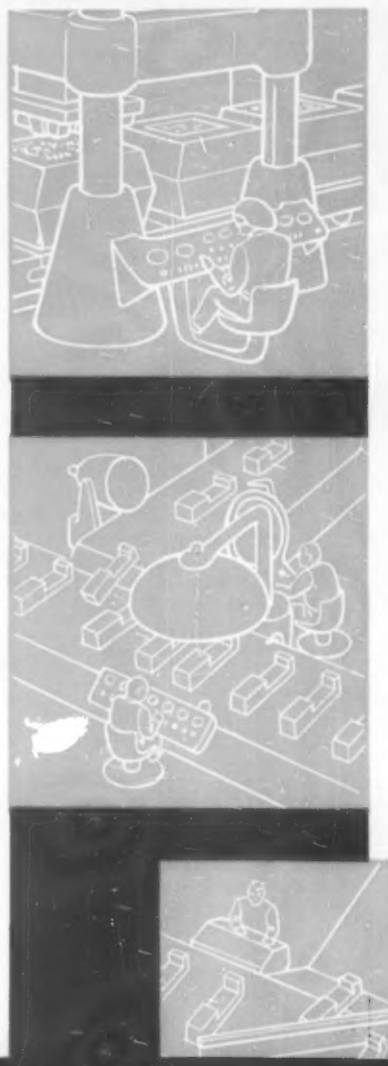

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Jeffrey Mfg. Co. **1814-1816**
Link-Belt Co. **1434-1436-1535-1537**
Moulders' Friend **1138**
National Engineering Co. **1412-1416-1511-1519**
Newaygo Engineering Co. **1740-1742-1841-1843**
Royer Foundry & Machine Co. **1913-1919**
Shaico Engineering Corp. **238-240-339-341**
Shallway Corp. **238-240-339-341**
Simplicity Engineering Co. 1108
Vacu-Blast Company, Inc. 1918
Westover Corp. **1443**
Jervis B. Webb Co. 1836
Whiri-Air-Flow Corp. **1326**

SAND LEVEL CONTROLS
Harry W. Dietert Co. **1527**
Haylco Controls Corp. 104-106

SAND RECLAMATION
Hydro-Blast Corp. **1438**
Nichols Engineering & Research Corp. 232

SAND STABILIZERS
Archer-Daniels-Midland Co. **1636-1638**

SAND STORAGE
George F. Pettinos, Inc. 228-230-329-331

SANDS, COATED
Acme Resin Corp. **1305**

SCREENS (SEE ALSO VIBRATING SCREENS)
Ajax Flexible Coupling **1840**

SEACOAL
Penn-Rillton Co. 333

SHAKEOUT MACHINERY
Allis-Chalmers Mfg. Co. ... 1737-1739
Simplicity Engineering Co. 1108

SHELL COREMAKING EQUIPMENT
C & S Products Co., Inc. 1944-B
Harrison Machine Co. 1321

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Shaico Engineering Corp. and Shallway Corp. **238-240-339-341**
Shell Process Inc. **1312-1314-1316**
Sutter Products Co. **1336-1338**

SHELL MOLD BINDERS
Acme Resin Corp. **1305**
Archer-Daniels-Midland Co. .. **1636-1638**
Barrett Div., Allied Chemical & Dye Corp. 1944-A
Borden Co., Chemical Div. 1914-1916
Durez Plastics Div., Hooker Electro-chemical Co. **218**
General Electric Co. **1924-1926**
Hickory Specialty Co. 1736-B
Monsanto Chemical Co., Plastics Division 1827
Specialty Products Co. 1736-B

SHELL MOLDS
Baird Associates, Inc. 1835
Harrison Machine Co. 1321
Shell Process Inc. **1312-1314-1316**

SHELL MOLDING MACHINERY
Beardsley & Piper Div., Pettibone Mulliken Corp. **416-420-422-503-504-506-507-508-509-603-607-609**
C & S Products Co., Inc. 1944-B
Harrison Machine Co. 1321
Link-Belt Co. **1434-1436-1535-1537**
Osborn Mfg. Co. **1440-1442-1541-1548**
Shaico Engineering Corp. and Shallway Corp. **238-240-339-341**
Shell-O-Matic, Inc. **1948**
Shell Process Inc. **1312-1314-1316**
Sutter Products **1336-1338**

SILICA
General Refractories Co. 1327
Great Lakes Foundry Sand Co. 1812

SILICA FLOUR
Ayers Mineral Co. 312
New Jersey Silica Sand Co. 125-127-129

SILICONES
General Electric Co. **1924-1926**

SILVERY PIG IRON
Hickman, Williams & Co. **403-405**

SMOKE AND FUME CONTROL
American Air Filter Co. **1309-1311**
Grindle Div., of C. O. Bartlett & Snow Co. **1722-1726**

SODA ASH
Solvay Process Div. Allied Chemical & Dye Corp. 809

SPECTROGRAPHIC EQUIPMENT
Baird Associates Inc. 1835

SPIEGELEISEN
Hickman, Williams & Co. **403-405**

STRAINER CORES
Louthan Mfg. Co. **2011**

TANKS
Claude B. Schneible Co. .. 704-706-708

TEMPERATURE CONTROL AND RECORDING DEVICES
Charles Engelhard, Inc. 2003
Pyrometer Instrument Co., Inc. . 1736A

TESTING EQUIPMENT (SEE LAB AND SCIENTIFIC EQUIPMENT)

TESTING, NON-DESTRUCTIVE
Budd Company 1337-1339
Eastman Kodak Co., X-Ray Div. .. **401**
Magnaflux Corp. **1837**
Picker X-Ray Corp. 1534

THERMOCOUPLES
Charles Engelhard, Inc. 2003

TIRES
Mitchell Industrial Tire Co. 2110

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TOOLS
Springfield Facing, Inc. 330
Thor Power Tool Co. 1839
United States Electrical Tool Co. .. **2007**
Cleco Div., Reed Roller Bit Co. .. **709-711**

TRACTOR SHOVELS
Allis-Chalmers Mfg. Co. 1737-1739
Clark Equipment Co. 1340-1439
Frank G. Hough Co. .. 1923-1925-1927

TRANSMISSION EQUIPMENT
Hewitt-Robins, Inc. 1738

TRUCKS
Sterling Wheelbarrow Co. **1911**
Whiting Corp. 1932-1934-1936-1938-1940

UPSETS
Adams Co. **808-810**

VACUUM CLEANERS
G. H. Tennant Co. 1335
Spencer Turbine Co. 1009

VACUUM DEGASSING EQUIPMENT
Centrifugal Casting Machine Co. .. 302

VALVES
Ross Operating Valve Co. 1307
A. Schrader's Son Div. 1933

VENTILATORS
H. H. Robertson Company 1542

VIBRATION (SEE NOISE AND VIBRATION ABSORBING MATERIALS)

VIBRATORS
Cleveland Vibrator Co. **423**
Martin Engineering Co. **1310**
Osborn Mfg. Co. .. **1440-1442-1541-1548**
Spo, Inc. 1834-1937
Tabor Mfg. Co. 1634-1735
Vibron Div. Burgess-Sterbentz Corp. **102**

VIBRATING SCREENS
Allis-Chalmers Mfg. Co. 1737-1739

WELDING AND CUTTING EQUIPMENT
Linde Air Products Co. Div. of Union Carbide and Carbon Corp. .. 1635-1643
Air Reduction Sales Co., Inc. 902

WEAR RESISTANT MATERIALS
A.I.C. Engineering Co., Inc. 137

WHEELBARROWS
Sterling Wheelbarrow Co. **1911**

WOOD FLOUR
American Colloid Co. **912**

ZIRCON SAND AND FLOUR
Orefraction Inc. **111**

MARIE MCCULLOUGH / *Staff Hostess*

Style show, feature of ladies convention program, will feature "Summer Silhouettes" and a surprise finale.

AFS CASTING CONGRESS

LADIES PROGRAM

■ A five-day program of entertainment for lady guests has been developed for the Castings Congress by the American Foundrymen's Society. The Society itself has sponsored and made all arrangements for the Ladies Program this year, a departure from usual practice. All ladies attending the convention, whether or not their husbands are members of the Society, are cordially invited.

Highlights of the Ladies Program include the Exhibit itself in the Convention Hall. All ladies are invited to attend the Exhibit as guests of the Society. Visit to an art gallery and an orchid nursery, a fashion show and luncheon, a demonstration of flower arrangement, and a musical luncheon program are included in the specially arranged entertainment. All ladies are also specifically invited to many AFS social affairs, including official AFS Reception and Tea, the Annual Dinner and the AFS Canadian Dinner.

Mrs. Bruce L. Simpson is honorary chairman of the Ladies Program and Mrs. Frank W. Shipley and Mrs. Harry W. Dietert are honorary co-chairmen. Other hostesses are wives of the directors of the Society.

Registration for ladies begins at 9:30 a.m. Thursday, May 3, and is from 9:30 a.m. to 4 p.m. Thursday through Monday, except that there is no registration on Sunday. On Tuesday, registration is 9:30 a.m. to 12 noon.

Details of the program are:

Thursday, May 3, 3 p.m. to 5 p.m. Official AFS Reception and Tea, Trimble Hall, Claridge Hotel. Mrs. B. L. Simpson and Mrs. F. W. Shipley, wives of the president and vice-president of the Society, respectively, will preside at the tea table.

Friday, May 4, 10 a.m. to 2 p.m. Conducted tour of the Art Galleries of the Hotel Dennis at 10 a.m. Refreshments and short lecture in the St. Dennis Room at 11 a.m. Tour of the Brighton Orchid Nurseries, via AFS special buses at 12 noon. Arrival back at Hotel Dennis not later than 2 p.m.

Friday, May 4, 7:30 p.m. Annual Dinner of the American Foundrymen's Society. Tickets on sale at Registration Headquarters for $10. Guest speaker will be Dr. Norman Vincent Peale. Distinguished members of the Society will be honored with gold medals and honorary life memberships. (Souvenirs for all ladies attending the dinner.)

Saturday, May 5, 12 noon to 3 p.m. Luncheon and fashion show at the Ocean Terrace and Crystal Dining Room of the Ritz-Carlton Hotel. Commentary by Mrs. Marie McCullough.

Sunday, May 6. No organized events but husbands and wives are invited to the AFS Canadian Dinner at 7:30 p.m. in the American Room, Hotel Traymore. Tickets available at Convention Headquarters, $8 per person.

Monday, May 7, 2 p.m. to 4:30 p.m. Fashions in flower arranging demonstrated by Mrs. Thelma Utt, state chairman of flower show schools in Virginia. Refreshments will be served.

Tuesday, May 8, 12 noon to 2:30 p.m. Luncheon and "Musical Mishaps", an entertainment by Miss Gertrude Niedlinger based upon unintentional "boners" committed by stars of the concert stage.

Mrs. Bruce L. Simpson

Mrs. Frank W. Shipley

Mrs. Harry W. Dietert

Continuous process; automation; new alloys, metal, techniques; a greater emphasis on precision castings and "as-cast" finishes are predicted for . . .

THE FOUNDRY OF TOMORROW

A MODERN CASTINGS BONUS

Step into the Foundry of Tomorrow with the editors of MODERN CASTINGS and the 15 contributors pictured on the next page. This special 24-page section was written with their assistance as part of The Foundry of Tomorrow theme of the 1956 AFS Castings Congress. The illustrations were prepared by Artist Malcom Smith.

THEIR IDEAS CREATED THIS SPECIAL REPORT

GEORGE W. CANNON
Retired, Chairman of the Board
Campbell, Wyant & Cannon Foundry Co.
Muskegon, Mich.

HANS J. HEINE
Technical Director
American Foundrymen's Society
Des Plaines, Ill.

W. REX JENNINGS
Superintendent
John Deere Tractor Works
Waterloo, Ia.

EDWARD H. KING
Vice-President and General Manager
Hill & Griffith Co.
Cincinnati, Ohio

LESTER B. KNIGHT
President
Lester B. Knight & Associates, Inc.
Chicago, Ill.

JAMES H. LANSING
Technical and Research Director
Malleable Founders' Society
Cleveland, Ohio

C. T. MAREK
Professor of Chemical and Metallurgical Engineering
Purdue University
Lafayette, Ind.

S. C. MASSARI
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National Engineering Co.
Chicago, Ill.

GLENN W. MERREFIELD
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HAROLD E. PRIDMORE
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Palo Alto, Calif.

DAN L. SMITH
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JAMES H. SMITH
General Manager
Central Foundry Division
General Motors Corp.

JAMES THOMPSON
Retired, Chief Works Engineer
Continental Foundry & Machine Co.
East Chicago, Ind.

FRED J. WALLS
Manager, Detroit Section
International Nickel Co.

ROBERT A. WILLEY
Assistant Technical and Research Director
Steel Founders' Society of America
Cleveland, Ohio

THE FOUNDRY OF A.D. 2001

Imagineered by Dan L. Smith

■ On this nasty February day of A.D. 2001 we are visiting the plant of a well known manufacturer of air conditioning equipment. The plant is located 10 miles east of Visalia, Calif., at the edge of a small residential community. The product is the machine chassis and there are five foundries, one for each model under production on five production lines. The metal is delivered by pipeline from a melting unit over in the corner. This unit resembles an electrical substation and in fact contains one. There really doesn't seem to be anything to it: no noise, no dirt, no metal, not much of anything.

The casting machines are enclosed and the castings emerge without sprue or risers. There weren't any; the metal solidified back to the feed reservoirs and then the mold moved on to the cooling station.

The rough casting is inspected and a ram pushes it through a shaving die (to remove the fin) into the assembly machine. This part is not machined. Subsequent parts are welded on or, if expendable, fastened with adhesive. This part seems quite warm. Why? Because the part is being produced here, half way down the assembly line, by a die casting machine. Here is a housing, injection molded from plastic, and here an electroforming unit producing thin pressure vessels. And there are presses, chewing up strips of metal and spitting out parts. All of this equipment is mixed up together in a manner related by requirements rather than by function.

Did we say there was a foundry? There was a foundry area, but we are in a manufacturing plant and casting just happens to be the most economical process for some components.

This morning we were in a job foundry. This particular foundry uses plastic patterns made in their engineering department to customer specifications. To produce molds the patterns are suspended in a tank full of clay-like suspension. When the required thickness of mold has formed, the patterns are withdrawn, the molds cured in a gas chamber, stripped from the patterns, inserts and cores added, the molds closed, clamped in a casting machine, and poured. Undercuts and intricate shapes can be cast because parts of the patterns are elastic. The mold disintegrated in the abrasive cleaning step and the casting is ready for inspection. This is the foundry of A.D. 2001.

THE CASTINGS FUTURE

■ The castings process is the shortest path between raw metals and a useable product. Nearly all metals must travel along this path before they can be fabricated and become useful. The process has been called a thermal-fluid or a thermal-liquid path.

The dominant property of a fluid is its ability to conform to almost any shape. It is to this ability that the foundry processes owe their enormous versatility. There are many complications along the path, but fluidity is the crucial thing.

The creativity of a process that can take a pile of old broken-up and otherwise useless junk metal and in a few steps, and with a minimum amount of equipment, transform it into new machine parts, household objects, or pieces of art is an amazing thing. It has captured the imaginations of men through the ages.

It is to this fluidity, and to the advantages that it has, that the foundry of tomorrow will owe its existence—even as it does today.

In the foundry a frequent complaint even today is with the involved shapes that a plant is called upon to cast. Foundrymen sometimes forget that simple shapes can frequently be rolled or extruded cheaper than they can be cast. And a principal advantage of the foundry process is its ability to closely duplicate complex and unusual shapes.

But there are other desirable traits of castings which often make them better than other processes, even for simple shapes.

Castings frequently can be finished as cast—even to the most accurate dimensions. Some alloys with very desirable properties for special applications cannot be rolled or forged at all—but must be cast to shape.

The realization has finally spread that a casting can be fully equal in physical properties to wrought material and sometimes superior with respect to grain orientation. Castings have inherent stability and resistance to grain growth.

These desirable characteristics can result in production of engineering parts which are cheaper, lighter, more durable than wrought parts—and in many cases they are parts which could not be produced by any other process.

With all these tremendous advantages, and with new developments still to come, who can doubt that the industry has a great future?

And what of the plants in which these castings of tomorrow will be made? Human foresight is fallible for who can know what developments in research and technology will open up new directions for foundrymen to travel, or even create what atomic scientists have learned to call "a major breakthrough?"

But we can know that a great deal of progress is made up of little things. The observation that a fiber brush sweeps the foundry floor better than a bristle brush, that a wet tool can be used to pick up loose sand grains, that a coating of wash can stop burn-in, that a water spray hardens the surface of cores. This is also progress.

In the past, many improvements of this kind were made by uneducated little men with sand in their shoes. They had the intelligence, imagination and interest to improve on what they saw—with far less equipment, less recognition and less help than we have now.

Today this process continues more rapidly than ever. There is a place for anyone who can observe, understand, organize. It doesn't have to be on a high theoretical plane. The more miserable and unproductive a given job is the more room there is for improvement. The simple improvements are often most significant.

It is out of a composite of little things and big things that today's foundry will become the foundry of tomorrow. The men who contributed to this special section may disagree in some of the details but they have one conviction in common—the foundry of tomorrow will be a fascinating and wonderful place.

RESEARCH

There's nothing wrong with an investment that pays at the rate of 100% annually.

■ Metallurgy was once thought of as being the science of separating metals from their ores. In the foundry today it has expanded to the point where it embraces nearly all operations. It includes, in addition to melting, the refining, alloying, shaping and treating of metals to obtain optimum mechanical and physical properties.

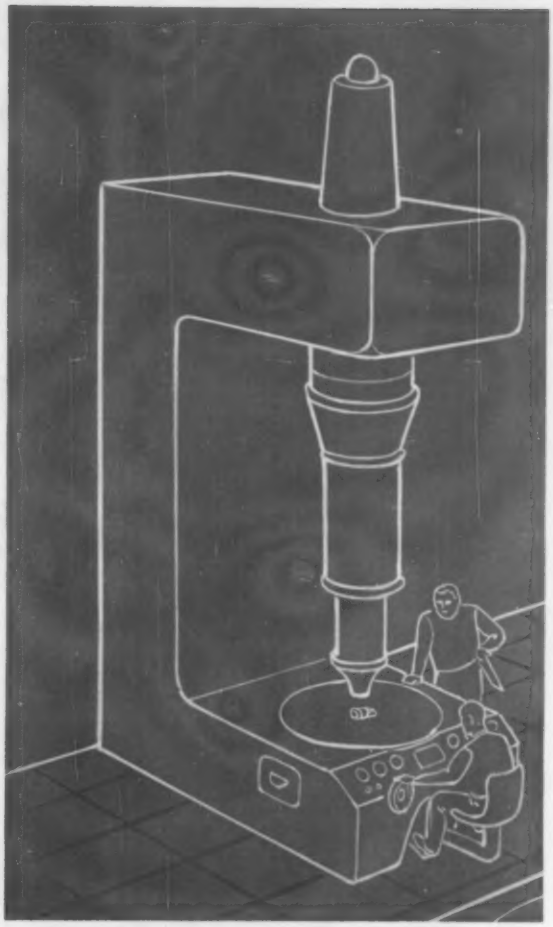
In a sense, every foundry becomes a laboratory where the knowledge of the laws of chemistry, physics, thermal dynamics, hydraulics and other engineering sciences govern the quality of output.

In the field of formal research, however, the metal industries as a whole have lagged far behind many others. A study for 1952 found that annual research expenditures in the metal industries amounted to only 1/2 of one per cent of annual gross sales, compared with over 2 per cent for machinery, nearly 4 per cent for industrial chemicals and 5 per cent for drug manufacturers.

Raymond H. Ewell of the National Science Foundation estimates that an investment in research and development on an average will pay for itself in increased productivity in about six years. After 12 years an average project should contribute annually an amount exceeding the original research expenditure.

Basic research, taken by itself, is estimated to produce an annual addition of 100 per cent to 200 per cent to productivity.

It thus is obvious that while research can be expensive, it is an extremely sound long term investment and, given enough time, pays off very well.



Huge electron microscope in the foundry of tomorrow will be used to study the fine details of metal structure. Man sitting at machine is observing a screen which reproduces magnified image of subject being examined in lab.

Basic research, which is of potential value to everyone in the industry, is generally considered to be best supported by cooperative effort. Organizations such as AFS are rapidly expanding the scope and extent of their research activities.

There are still compelling reasons for private concerns to do basic research in addition to their development work. The conservative long established companies which are best able to afford it are

RESEARCH *Continued*

Even though foundries tend to lag in research, it is changing them radically.

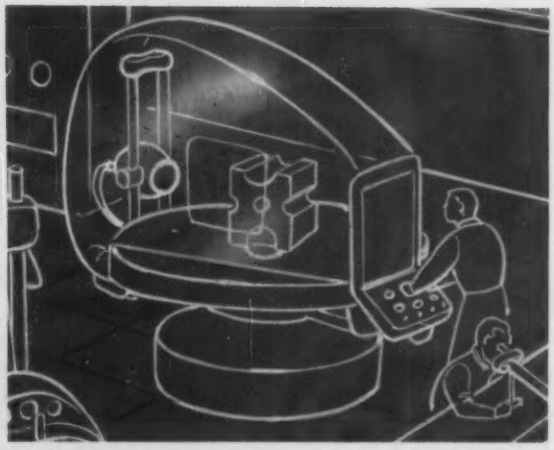
likely to overlook research because of its speculative nature but the high potential gain is too attractive to ignore.

Such expenditures by foundries, while still small, are growing, however. One reason is the encouragement of such programs by government tax policies. How far to go is a question but an annual return of 100 per cent has obviously not reached a point of seriously diminished returns.

The castings industry is now enjoying the benefits of basic research work done 10 to 15 years ago. These developments include shell molding, nodular iron, investment casting, dielectric core baking, the use of oxygen in melting, and many others. We are already going on to vacuum melting, casting of titanium, molybdenum and similar reactive metals, automatic molding processes, carbon dioxide hardening of molds, development of new alloys and other improvements.

This is only the beginning. Dan L. Smith of the Electric Steel Foundry Company of Portland, Ore., lists the following promising lines of investigation during the foreseeable future—not necessarily in order of importance.

- Improvement of sand mold techniques.
- Extension of metal mold techniques.
- Further development of investment casting techniques.
- Gating and risering.
- Development of shell molding.
- Induction, arc, vacuum, melting equipment.
- Cupola improvements.
- Uses of oxygen and other gases for refining.
- New understanding of metals.



A fluoroscopic process is used in foundry laboratory to examine castings. Transparent radio-opaque cover shields research workers from radiation harm.

- New alloys.
- Casting design.
- Tightening of specifications and tolerances.
- More production work.
- Control of noise and dust.

Twenty years ago foundrymen were told that addition of from 5 per cent to 20 per cent of aluminum to iron would produce a series of alloys with excellent oxidation and fair corrosion resistance but too brittle for much use.

Today, two of the most promising new alloys fit into this classification although they are ternary alloys which include elements from groups 5 and 6 of the periodic table.

The point is that 20 years ago foundrymen didn't realize that they were talking about an alloy containing iron, aluminum, silicon, manganese, carbon, nickel, copper, phosphorous, sulphur, oxygen, nitrogen and hydrogen, probably with enough of half a dozen other elements to profoundly affect some of the physical properties.

Aluminum companies today are producing aluminum 99.97 per cent pure, with valuable physical properties and at prices that foundries can afford. This may be extremely significant to future foundrymen.

It is becoming imperative that the whole spectrum of possible alloys be re-explored. Some are castable; many undoubtedly are of value as yet undiscovered.

As specifications close and standards of control become more rigid—a continuous process today—the significance of trace elements become of vital importance.

The metallurgy of minute additions is already assuming significance. In the first quarter of the 20th Century most alloy chemical control was limited to those metals appearing in amounts of one part per thousand by weight or more. In the second quarter of the century many instances were found in which one to 10 parts per hundred thousand had profound effects on the properties of metals.

For instance, small amounts of

boron greatly increase the allowable size of a steel part one may thoroughly harden. Minute additions of bismuth greatly increase the size one can cast in white iron. Small percentages of calcium have been reported to increase the life expectancy of resistance wire many times.

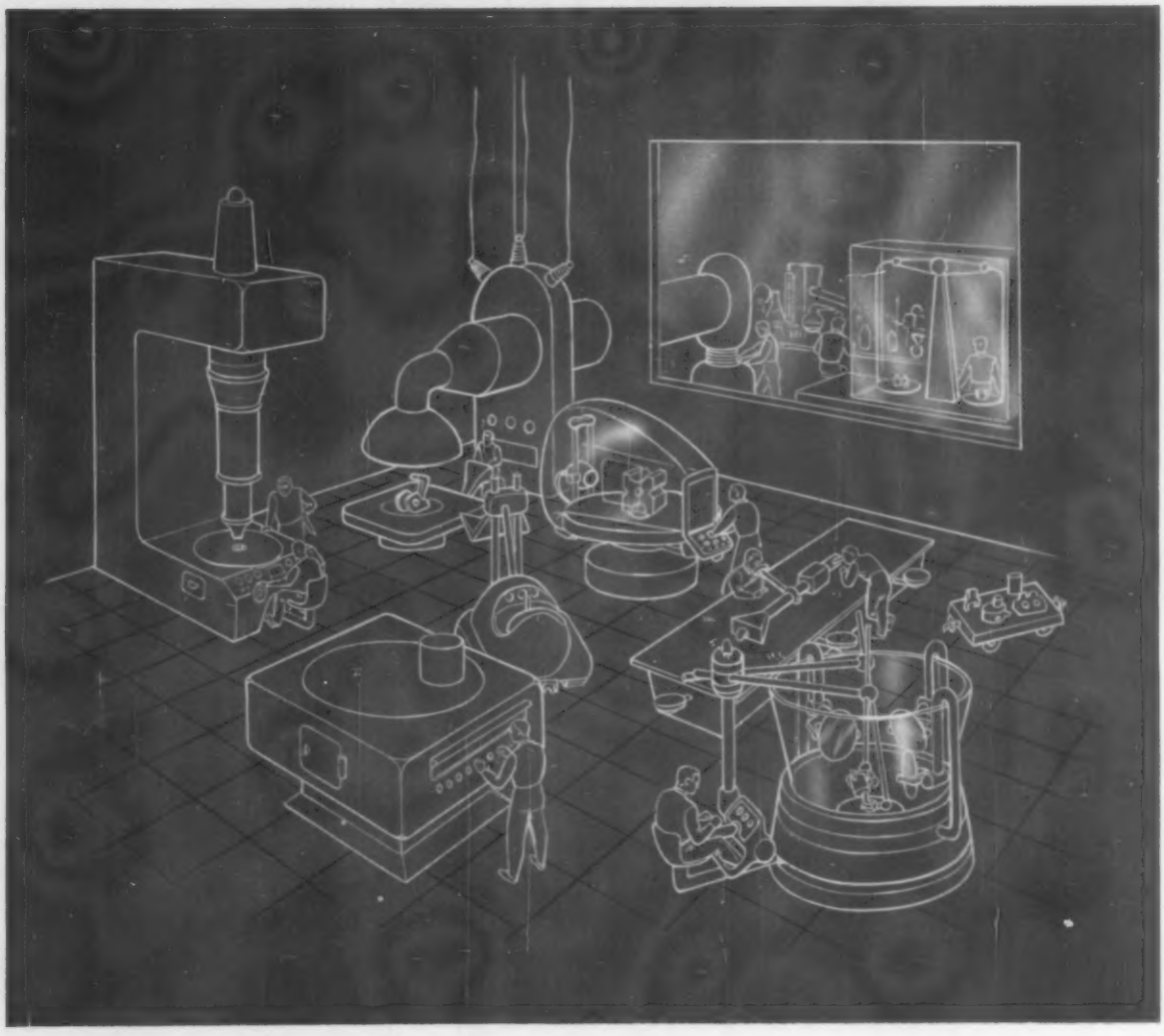
The mystery of the so-called "heredity" in pig iron may conceivably be explained by the presence of minute quantities of metals.

Malleable iron may be made without annealing. In the past year iron has been produced which contained about one-half of the total carbon as nodules in the "as cast" state. There is much promise in this long-range program.

Metal casting has been called the oldest of the arts and the youngest of the sciences. The research of yesterday created the technology of today. That of today is already changing tomorrow.

Progressive foundrymen will be forced to utilize all available advancements in techniques, engineering talent and metallurgists experienced in technology. The whole field is on the move. And it's moving fast.

The laboratory of tomorrow may contain many such instruments. Center foreground is a direct reading spectroscope for rapid qualitative and quantitive analysis. Right foreground is a complex machine used to study radioactive materials. Other equipment includes (middle center) an infra-red inspection machine and, behind glass in a controlled atmosphere, a wet analysis laboratory.



MATERIALS

New metals are certain to come into use as "older" metals grow scarce. Foundry technology will change and conservation measures increase as this comes about.

■ Increasing scarcity of materials commonly used today, and their replacement by improved or substitute materials in the future, is an already visible trend, certain to increase in the Foundry of Tomorrow. Scarcity arises because of depletion of natural resources, the increasing demands of population and the productivity of our economy. Furthermore, we are shipping abroad mountains of scrap to highly competitive nations which further depletes our own domestic stocks.

Some non-ferrous materials are becoming increasingly scarce. No statement has been made as to when these metal supplies will become critical. The day may be far in the future, but it must come ultimately.

But foundrymen need only contemplate the present situation in aluminum to know that tremendous substitutes for presently used materials are likely to appear.

Today, only about 25 of the 70 or more known metals are produced in commercial quantities and many of these are plentiful in nature. Aluminum and magnesium are "new" metals which have already matured. More recently, titanium and zirconium have grown in utility whereas a few years ago they were laboratory curiosities. Others still await discovery. They are bound to come.

Conservation methods which will save many metals otherwise wasted are needed. There is a five per cent or greater metal loss in the process of converting molten metal into finished castings. An estimated one million tons or more of iron goes out of foundries as a total loss in the form of tramp metal each year.

Man directs string of materials cars which shuttle between storage areas and foundry. This is only one idea of materials handling in tomorrow's foundry.

This loss will be changed by engineering to size, economical salvage equipment, and departments to take care of all refuse, crushing, if necessary, so that complete separation can take place. Properly engineered installations will pay handsome dividends in most foundries.

Another form of conservation is in the development of anti-corrosion materials and coatings. It has been estimated that corrosion in iron and steel alone cost industry $8 billion in 1950—equal to two per cent of the gross national product.

Development of corrosion resistant coatings and casting materials with better inherent corrosion resistance is a certain development of the future.

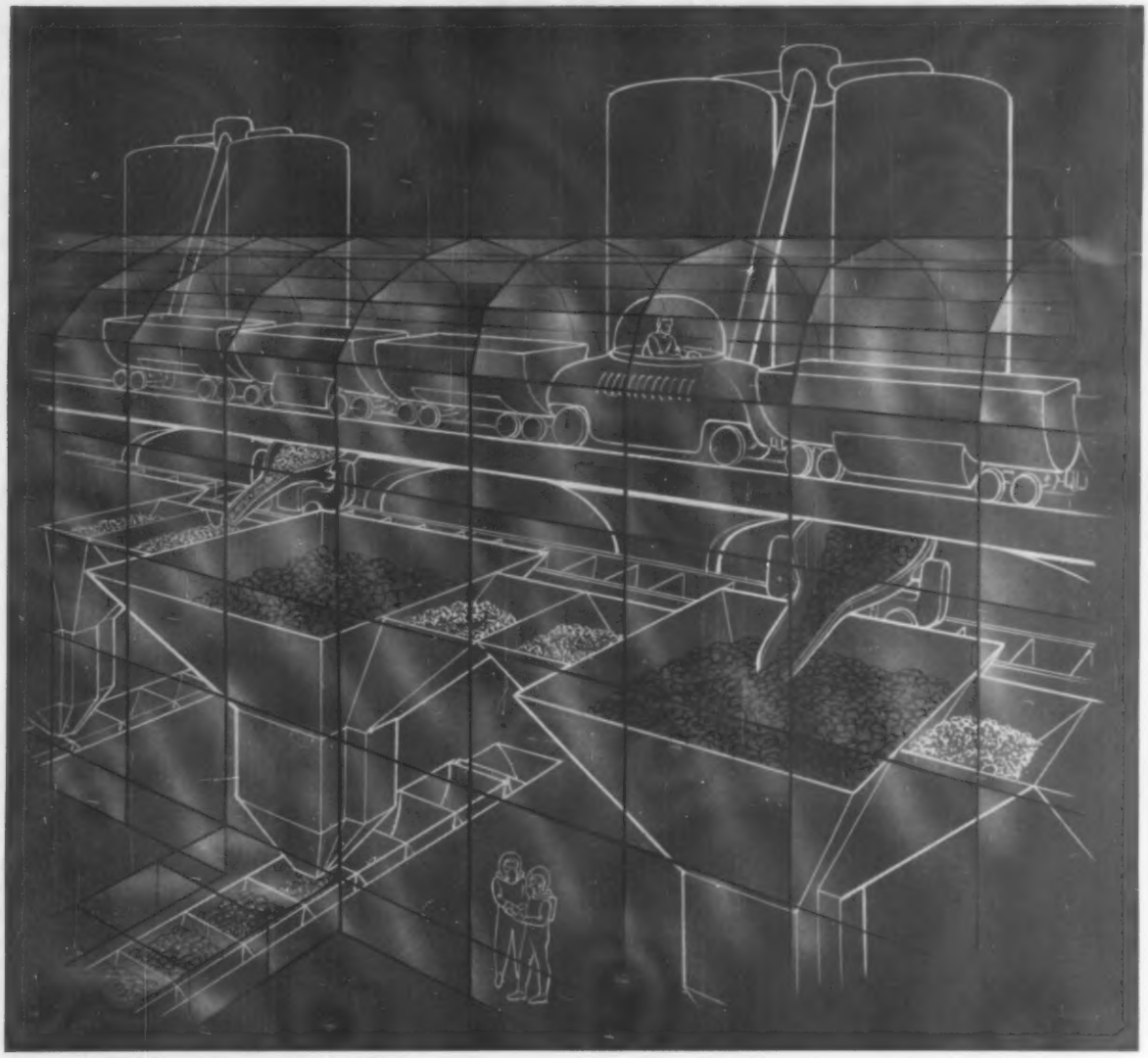
More carefully engineered castings to conform to service conditions will also help to conserve materials. The properties of the metal or alloy will be close to optimum and controlled to a high degree of uniformity. More knowledge by the designer of the service conditions and materials properties of castings will be required.

Iron has a theoretical tensile strength of over 1 million psi, yet commercially produced iron has a strength of only about 40,000 psi. General Electric Company has pro-

duced some pure iron crystals with a strength around 1 million psi. This shows the potential and foundrymen will never be satisfied until they reach it.

Foundry materials other than metals seem to be in good supply. Sand is expected to remain the basic molding material for a long time but many changes will be likely in additives—especially in seacoal, wood flour, cereal by-products and clays. Some foundrymen believe that a more stable molding medium is needed. Present molding sand requires constant replenishment of these additives because of their destruction by high metal temperatures. The instability of many such products leaves the field and the future wide open.

New refractories will be developed to keep pace with metallurgical demands through the rapidly developing science of atomic structure and improved concepts in the nature of bond. In the future foundrymen may not have to look to the earth for refractories to contain their metals.



In dream foundry, overhead cars haul carefully prepared loads of raw material between storage areas and charge make-up area. The plastic or glass enclosures serve multiple functions. They protect the rest of the foundry against noise, dust and air pollution. Because the effect of minute additions on metals is increasingly recognized, they help keep outside contaminants from the charge. In addition, some of the new metals coming into use are poisonous and workers must be protected against them.

MATERIALS HANDLING

The entire foundry is a problem in materials handling; it has to be so when you handle 200 tons of materials for every ton of finished castings.

■ Mass production has been described as essentially a problem in materials handling. Progressive plant designers have suggested that the foundry of the future will be designed around a materials handling system which will be built first.

Materials handling is specially important in foundries because it has been estimated that an average of about 200 tons of materials are handled for each ton of castings produced.

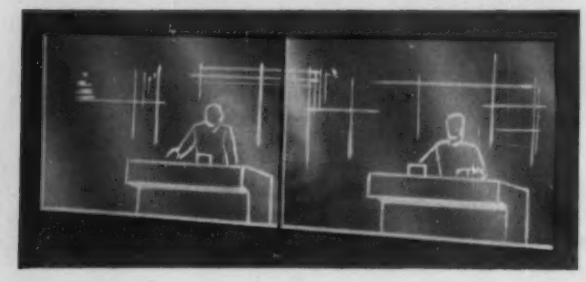
It has been estimated that in our foundries about 30 per cent of total labor costs are in handling materials. Most of these materials are the indirect materials that enter into the castings process and not the metals of the finished casting.

In addition to the requirements that materials be handled rapidly and economically, they must be handled efficiently as an integral part of the manufacturing cycle.

Much progress has already been made in the continuous-flow principle of manufacturing. Foundries have combined a continuous supply of cores, molding sand, iron and molds flowing onto a powered conveyor. Out of this has come a high-quality, low-cost product never before possible by the old batch method of floor molding.

But much remains to be done.

James H. Smith, general manager of the Central Foundry Division of General Motors Corp., believes that shell molding will contribute tremendously to the progress which will be made in continuous-flow manufacturing.



In some future day, the major foundry functions may be operated from central stations directing materials handling equipment by electronic remote controls.

At the Central Foundry division's Defiance plant, camshafts are being made in shell molds. The shells are made on blow-hot press shell making machines at the rate of about 60 per hour. They are placed on a pendulum conveyor for pouring and then go to the shakeout which has an automatic transfer device which pre-positions the gate of castings for automatic pick-up by the cooling conveyor.

The cooling conveyor then transports the gate of castings through the cooling area and through a cleaning cabinet where they are cleaned with a sand method developed by the division's engineers. This method does not destroy the characteristic smooth finish.

The castings then are taken on the conveyor to the debobbing operation where the gate of castings is removed from the conveyor and the four camshafts debobbed simultaneously.

At this point, the castings are inspected and then picked up automatically by a storage conveyor and transported to milling machines where a milling and centering operation is performed.

A transfer device picks up the

milled camshaft from the mills and places it in a cam hardener. After hardening, the shafts are deposited automatically on a table where final inspection takes place.

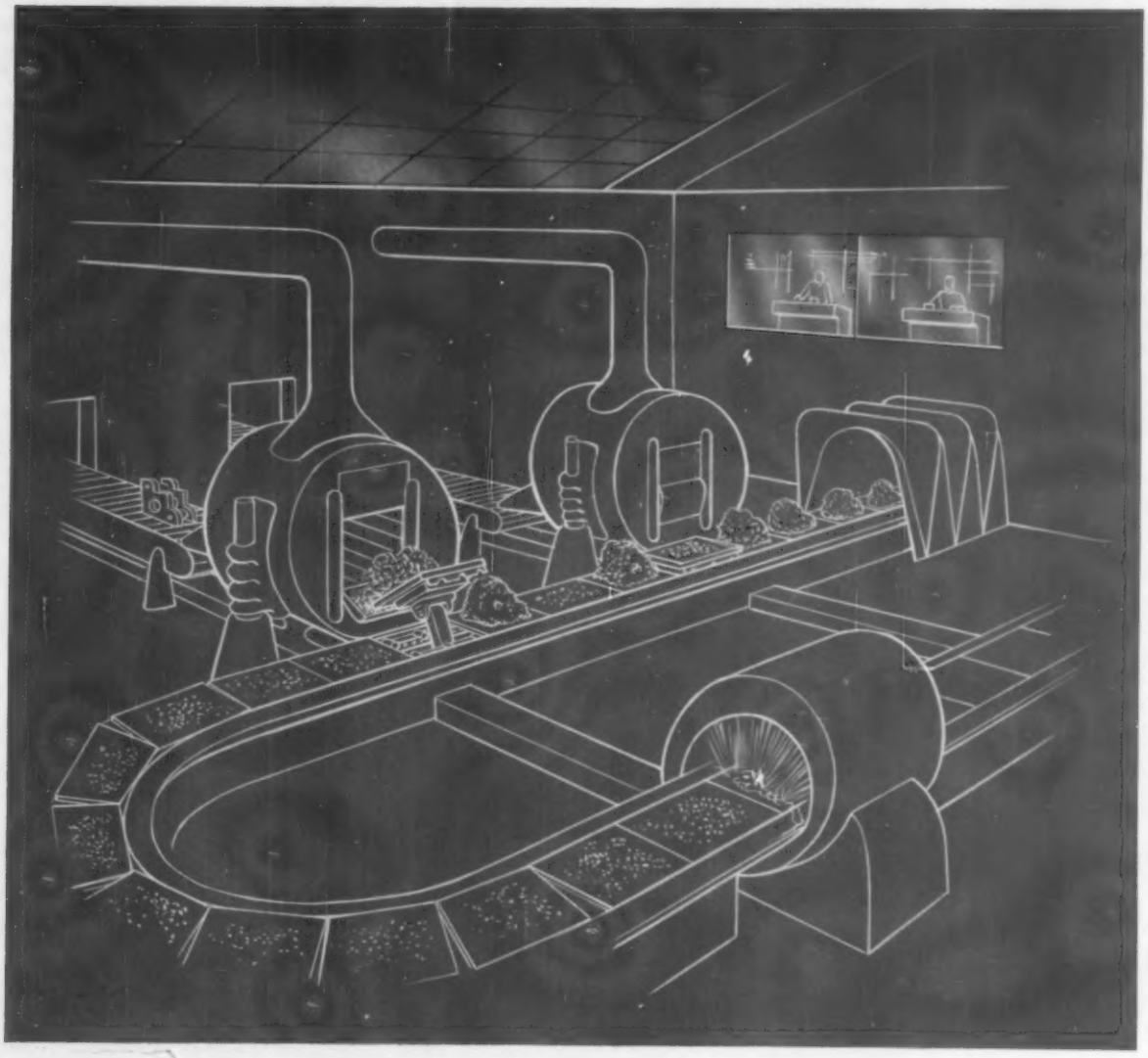
The continuous flow principle is also being applied to automotive crankshafts made of ArmaSteel by Central Foundry Division. The principle is being pursued vigorously in all the company's plants. Materials handling plays a key role.

The trouble with much materials handling equipment used in foundries is that it has not been designed specifically for foundry use. Bins, hoppers, cranes, belts, chargers, monorails, telepher systems, air conveyors, lift trucks will, in many cases, be substantially redesigned to fit into future foundry needs more precisely.

Continued improvement of materials handling equipment alone is not enough. Thorough study and unified engineering between shipper, receiver, storage areas and production line are necessary.

As in all levels of industry, new equipment alone is not enough. Improvements in organization, procedures, and human concepts are also necessary.

Shakeout department is one that has been fully mechanized with materials handling equipment. No human beings need enter here except for maintenance. Flasks have already been removed for immediate re-use at molding stations and the castings are selectively dumped, separated and moved down the proper finishing line. The machine at lower right is cleaning off conveyor car automatically.



MELTING

Developments are far along that presage immense changes in melting. Some of them are: water-cooled cupolas; atmosphere control; vacuum melting; new refractories.

■ Some of the cupolas built in 1900 may still be in operation in the year 2000. Nevertheless, the processes of melting and pouring in the Foundry of Tomorrow are undergoing both evolution and revolution.

The electronic developments underway, for example, will affect induction melting equipment, especially in the smaller units. Induction heating methods are in the midst of many improvements such as vacuum melting. Induction heating furnaces are compact, versatile and can be controlled to a high degree. Development of a compact, cheap and reliable power supply for induction melting would revolutionize small foundry activities and affect larger ones considerably.

The arc furnace will continue to improve by use of better refractories, improved control equipment and better charging equipment. Control of the furnace atmosphere and electro-magnetic stirring of the bath may become common.

The basic design of the present arc furnace is highly functional and will probably remain recognizable for a long time unless there is a change in function—such as a change to continuous melting and refining. An example of such special arc furnace design may be seen in the furnaces developed for re-melting titanium.

The cupola furnace itself is changing and developing so rapidly that it is difficult to sketch the advanced cupola of 50 years from now. Basic refractories, the water-cooled melting zone, blast control, blast preheat, oxygen enriched blast and many mechanical innovations for charging, control, clean-out and maintenance are rapidly proving their worth.

There will probably be special melting equipment that fits none of these classifications. Consider, for example, the air furnace which melts in the stack like a cupola. It works well.

Atomic reactors are basically a heat source and their applicability to melting metal is not fantastic. Physical and chemical properties of cast metals may be beyond anything now perceived.

One of the biggest potential improvements in cupola operation is in coke. Indeed, coke may not be the final answer to the fuel problem. It would be technically feasible now to produce fuel of controlled particle size, controlled combustion rate, with very low ash if desired or with the mineral content so balanced as to serve as the sole source of flux or alloys for the melting operation. Regardless, coke sizing will be used extensively; coke will be stronger, more uniform.

The cost of cupola repairs has been extremely high. To help reduce this cost, one company plans to try to operate its cupolas for one week without repairing. The melting will be on water glands instead of refractories, making it necessary to use projected water-cooled tuyeres with hot blast temperatures up to 1000 F.

Water cooled cupolas can be operated for much longer periods of time at an increase of 25 to 50 per cent in tons per hour melted. Hot blast equipment will be more generally used as a partner with water cooling and also to give betten control and more tons per hour.

Another aim will be to expand use of humidity control. Humidity control has been used on malleable iron cupola blast and in piston ring shops for many years with satisfactory results and the future will see the control applied to more gray iron cupolas. This gives a more uniform iron, a saving in coke and lower cupola charge costs.

Foundries will aim to use more low cost cupola charge materials such as a greater percentage of briquetted borings and briquetted steel turnings. There is a good possibility of adding gray iron borings and steel turnings without briquetting through the use of a new process which blows gray iron borings and steel turnings through the tuyeres of the cupola.

Foundries will aim to make thinner wall castings of good design to reduce casting weight. This will require hotter and more fluid iron,

such as can be obtained by such processes as the cupola electric duplexing process. By doing this, many castings which might otherwise be converted to non-ferrous material may continue to be made as iron castings.

For thousands of years foundrymen have been melting metals in a "controlled" atmosphere with a base composition of 79 per cent nitrogen, 20 per cent oxygen and 1 per cent argon, other gases including water, and oxides of sulphur, nitrogen, carbon and sometimes even petro-chemicals.

The limitations this atmosphere has imposed on practical operations has only recently been realized. Freed of them, foundrymen have an entirely new range of possibilities to explore.

The use of oxygen, dry air, nitrogen, halides and so forth in production processes is just the beginning of this control.

Vacuum melting or vacuum degassing of the melt somewhere along the production line is increasing rapidly and holds immense potentials in improving casting quality. In order to produce sound, pressure-tight castings, it is necessary that adequate feeding be provided and that the gas content of the melt be reduced to low values. Other things being equal, vacuum degassing treatments eliminate the gas problem which exists with all metals.

Control of the pouring operation is often one of the most neglected activities of the foundry. Clean hot metal, properly alloyed, melted and deoxidized is often splashed into the mold, mixed with air and sand and their reaction products. The cleaning room works overtime on such castings and their quality is impaired.

The light metals are especially prone to damage by gas porosity and oxide film defects but the same problems affect all metals. Here is a productive area for research and development and the foundry of tomorrow will show the results of it.

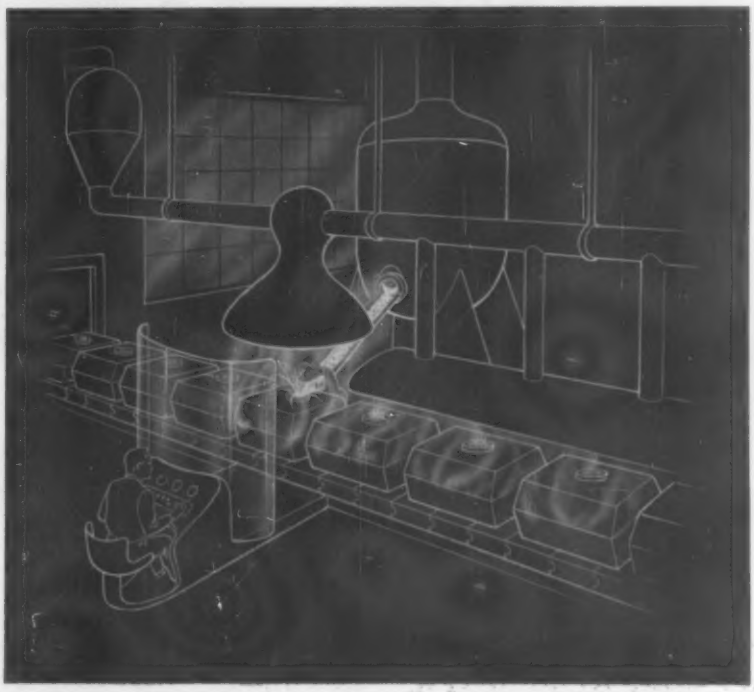
Alloy cast steels with tensile strengths over 200,000 psi and approaching 250,000 psi will be forthcoming soon by improving both the melting and the heat treating techniques. Vacuum melting, vacuum pouring or tapping, and pouring into a degassing ladle will be developed to produce high strength steels of aircraft quality. All steel foundries interested in producing high quality, high strength steel castings with section sizes of 1/8 in. and under will be equipped to utilize the vacuum somewhere in the melting, tapping, pouring or casting process.

Atmospheric controlled heat treating furnaces will also be a must for high quality, high strength steel castings because there can be no decarburization in the as-cast skin. This requires not only atmospheric controlled heat treating furnaces but also atmospheric control of the mold.

Adoption of the oxygen steelmaking process in steel foundries will be forthcoming soon to those foundries that have access to a blast furnace. Later the process will be developed so that it may be used in the steel foundries that do not have access to hot metal from a blast furnace. The rapidity of this development will be governed largely by the resulting improvement in the quality of the steel as well as by the ability of the steel foundries to increase molding capacity by developing automatic molding and pouring.

Whether pouring equipment available today will meet most future needs is questionable. Some foundrymen think it will but others look to direct pouring from furnace to molds moving along mechanized lines as a production line development bound to come. Certainly, temperature control instruments attached to telepher cars or ladles will be developed and these will indicate to the operator when to pour or will control pouring itself.

Melt pours directly from the furnace. A continuous line of molds is brought to the metal, instead of vice-versa. The flow of metal is controlled by the operator seated behind the plastic screen. After mold is filled, he swings the spout to the next unfilled mold.



CORE MAKING

Many foundrymen believe that cores will be made on the mold line, using similar processes, sand, and other materials.

■ Is the core making process of today doomed? A number of foundrymen think so, though not all agree.

Those who take the first view feel that it is becoming technologically possible for future foundries to perform coremaking operations right on the mold line—just as molding is performed now.

Three processes may make this possible: green sand core blowing, shell cores, and CO_2 cores. In addition, the process of "core shooting" may turn out to make a harder and better green sand core and improve that process.

If some of these developments work out as indicated the foundry of the future would have no core room as we know it now. Both cores and molds would be made on the spot and perhaps on the same or an adjoining assembly line.

Those who take the opposite view see core blowing as the principal method of making cores for the immediate years ahead even though core making will undergo considerable change. There is a great need for a binder with less evolution of gas, for example, and progress is expected with the use of quick setting binders.

The large core ovens of today may become obsolete, to be replaced by individual ovens at the point of core making. With the use of rapidly cured cores aluminum driers will see considerable less use. Accuracy and quality will improve. There will be a reduction in the use of core washes and finishing labor.

The core blowers of today, designed to handle sand with wide ranges of moisture and green strength, will need considerable revamping to meet the new requirement of blowing a sand with little or no moisture and no appreciable green strength.

Growth of the use of shell cores would, however, change this picture substantially. A core made by the shell process is ready for use shortly after removal from the core box. Therefore, much of the present day equipment needed in the core room can be eliminated. The core blowing machines can be moved near the molding lines, which will eliminate big drying ovens, core driers, core storage racks, and a great amount of trucking and handling of fragile sand cores.

The cost of phenolic resin used in the process has been one of the stumbling blocks. Aggressive programs are underway to find substitute materials. Other approaches include reducing the amount of resin and reducing material cost.

The use of shell cores in turn may produce substantial changes in patterns and pattern equipment. The pattern shops will move in the direction of tool rooms as patterns are made with closer tolerances.

Core drying will change substantially. In shell cores, for example, the core box will become the oven in many instances. Specifications of sands and binders will be defined more carefully to produce cores of more exact specifications.

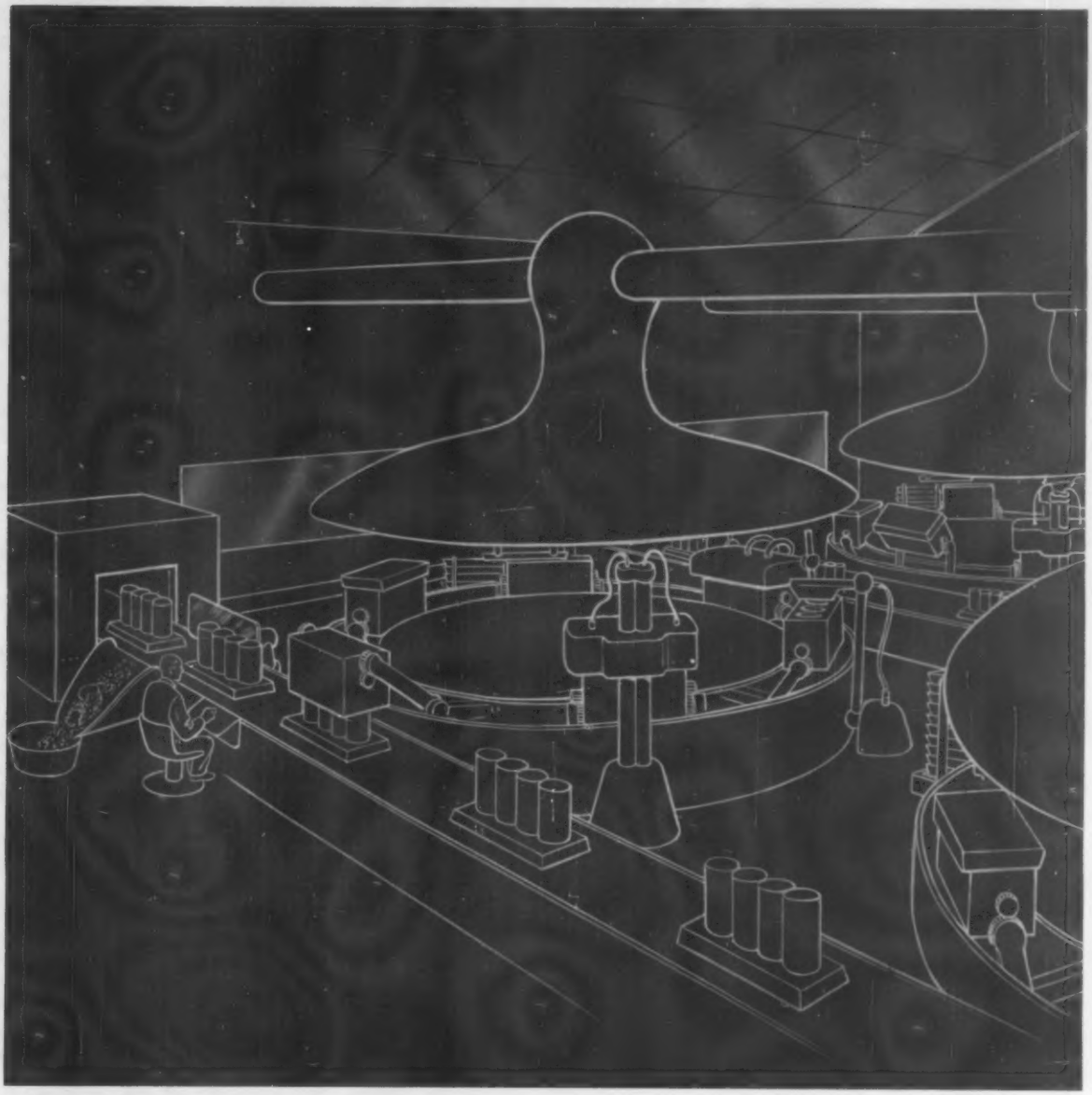
The developing of a coreblowing machine that not only blows the cores but hardens them automatically with CO_2 is in the offing and may even be demonstrated at the 1956 Castings Congress. The so-called cold set process is already reducing the need for core makers in some cases.

Application of the process will expand as catalysts are developed to hasten the hardening process. The method will be adaptable to semi-production runs and possibly to production runs.

Core blowing has always had to cope with certain difficulties, including venting the core box, the rapid wear of the equipment and the compounding of sands with adequate flowability.

A new "core shooting" machine employs fundamentally different principles and is claimed to have a number of advantages. Wear on equipment is said to be greatly reduced. The problem of venting is minimized. The operation has great flexibility and makes possible the use of a variety of sands. And the amount of compressed air needed "per shot" is said to be unusually small.

In the core shooting machine, velocity of air is low and there is only one large blow hole instead of many small ones. The compressed air does not enter the box and few vent holes are necessary.



Core making here is still a separate operation although many foundrymen believe it will become part of the mold line. Equipment produces and bakes the cores which are then carried along the line for careful inspection in accord with the greater precision required of future foundries. Actually, so many developments are underway in core making that tomorrow's methods may be quite different.

MOLDING

Automatic machine molding is bound to grow as demands for precision increase.

■ Molding in the foundry of tomorrow may be quite different from that in the foundry of today. The determinants are economy, efficiency and speed, and precision. The first two of these points can be assumed. One of the strongest trends at the moment is for castings having greater precision.

There are many reasons for this. One is that the more uniform castings are dimensionally, the better they adapt themselves to automatic or semi-automatic machining processes. In addition, there is a greater demand for more precision in castings of themselves.

The gateway to greater precision is believed to be the development of more controllable molding sands and materials and better molding equipment—and the reduction in importance of the human element. This is especially true of production type foundries—less true of other types.

It is a truism that castings suitable for shop automation must be made by automatic processes. They must be standardized—uninfluenced by weather, fatigue or the hangovers of human beings.

Molding machines are available to do this at present—performing the complete cycle of fill, jolt, squeeze and draw. Slingers with tape control make more uniform ramming.

Precision castings made in green sand are now in limited scale production and the future will see tremendous improvements in molding machine design to achieve further accuracy.

The fact that some shops consistently produce work of good finish and accuracy in green sand and that nearly all shops do so occasionally, even if by accident, shows the potential of green sand. Some foundrymen feel that if the same high standards and control demanded for some of the newer processes were applied to sand molds the results would approach and sometimes surpass work made in shell molds or metal molds. Superlative accuracy and finish is sometimes difficult to obtain in a sand casting but the extra effort is often justified. The greatest obstacles are in the minds of the people who do the work and in the minds of those who direct them.

Silica sand is not considered to be an ideal material for production of molds but it has the advantage of being inexpensive. The development of efficient sand reclamation equipment, on the other hand, is freeing foundrymen from the need to use a refractory of low first cost and opens up a host of other, but still little-known, possibilities.

Silica itself can be modified. A molding medium of fused silica grains would be expensive but perhaps not prohibitive, and the decrepitation of grains and cracking of the mold caused by allotropic conversion and expansion might be substantially reduced.

Bonding media for sand constitute a wide open area for investigation.

Metal molds, used so extensively in non-ferrous casting, have a broader future in ferrous casting.

Alloys with lower melting points predominate in metal molds but higher melting metals can also be cast in metal molds. Note the experimental use of copper molds to cast titanium and the extensive use of metal molds for centrifugal casting of all metals—including a large tonnage of steel.

The future will solve the problem of how to cast metal in metal molds more economically. One large step in this direction is the use of precision casting techniques to produce molds of moderate cost.

A considerable tonnage of iron is cast in metal static molds and steel may well be next. The potential advantages have been demonstrated in centrifugal castings.

There are even foundrymen who anticipate the die casting of iron and steel and the production of malleable iron that won't have to be annealed.

New processes in investment casting are being announced regularly. Most of them can produce good castings when properly used. There is a need for more attention to the problems of gating and feeding and to obtaining more castings of controlled grain size. Known methods could be applied—such as a controlled directional forced cooling of the castings.

Shell molding has revolutionized certain parts of the foundry business. It was perhaps oversold at first but is again on the upswing. Areas of improvement are still substantial and progress has been good.

Shell molding of steel castings has been greatly limited by mold-metal interface reactions and carburization but progress has been made and there is much yet to be done.

One plant, which initially could make only a few shells per hour

manually, soon had a machine with which one man could make 30 shells per hour. A new machine, known as a "blow-hot press", developed by Central Foundry Division engineers and the GM Research Staff, permits one man to make 60 camshaft shells per hour. With further development these machines will be making 90 to 100 shells per hour. The method permits use of thinner shells with resultant saving in material.

Shell molding resin consumption has increased from 250,000 lb in 1950 to 8,000,000 lb in 1954. While fundamentals of the process have not been changed there have been many process refinements. Bonding of shell halves with clamps, staples and bolts is no longer necessary. The shells have greater dimensional stability and they may be horizontally positioned. Back-up material can be eliminated. Recent developments include resin-coated sands, coating of shell mold walls to prevent carbon pickup, and incorporation of grain refiners in the coating.

The CO_2 process also applies to the making of molds. It seems certain to grow rapidly in the next few years. The process depends on the formation of a gel (silicic acid) which is set free when carbon dioxide reacts with water glass (sodium silicate). The silicic acid binds the sand grains strongly together.

CO_2 molds use sands designed for steel, gray iron and all nonferrous metals. The process is claimed to be inexpensive and eliminates core and mold drying.

High pressure molding is another growing development. Pressure molding is a process in which molding pressure, sand flowability and mold shape are regulated to give green sand mold density capable of reproducing pattern dimensions with accuracy and consistency.

High pressure sand is unusually fine and is specially treated to develop a combination of high strength and high flowability with low moisture. The sand gives good finish and dimensional control in any type of molding equipment capable of pressures ranging from 80 to 600 psi.

Most common "pressure" molding equipment has a diaphragm which conforms to the pattern contour and gives greater effectiveness than a flat squeeze board. Its life expectancy is from 10,000 to 60,000 molds.

All pressure molding at present is being done on cope and drag equipment. Match plate work is not considered advisable because the plate flexes under high pressure.

For the most part, 100 psi pressure is being used on the machines and the molds are of varying size. There is no theoretical limit to the length of the diaphragm. Production rates now vary from as few as 50 molds per day to as high as 270 molds per hour per machine.

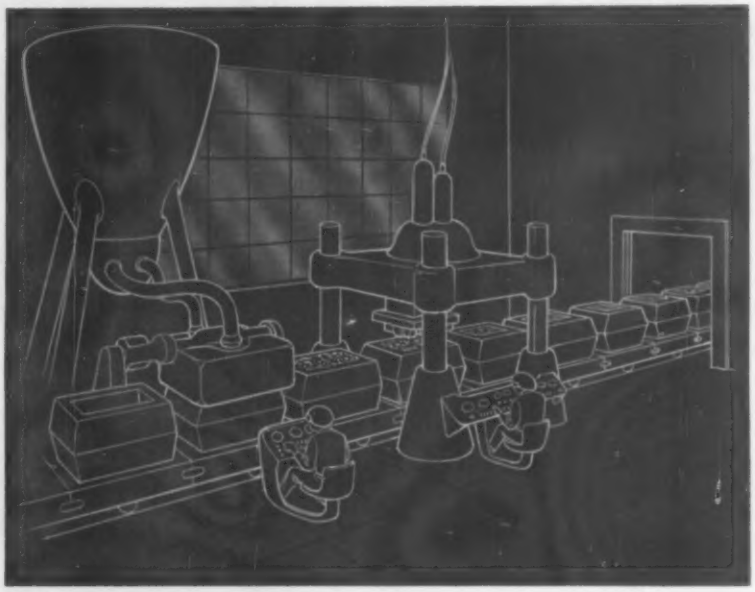
Pressure molding is only one of the advanced methods of using green sand of which we will see more in the future.

Ceramic molds may presage revolutionary changes in molding and gating. Ceramic-type molds can be expendable, semi-permanent or permanent. They are gas-free and result in castings of excellent surface finish and tolerance.

Of the types, those which can be dried or cured at low temperatures appeal to foundrymen. Molds formed by hydrostatic pressure will demand new machines. Ceramic molds may also be produced by a shell molding process using ceramic materials as slurries.

Studies have been underway for some time on the use of ceramic materials for steel castings. The trend to ceramic-type molds will soon become evident in many steel foundries.

Much work has been done on gating and risering under the guidance of the research committee of the AFS Light Metals Division. The designs have been developed by studying the flow of water through transparent models. Use of the general principles developed by this research will certainly help foundrymen improve casting quality in the future. Mechanized foundries, especially, will benefit from these studies.



A continuous molding line of the future may see sand blown into flasks at left which then move along the line to be packed by high frequency vibration and, if necessary, baked dielectrically. Industrial automation demands more precision in castings.

SAND

More reclamation, better quality control, precision standards are in the sand future.

■ With increasing focus on casting quality, more attention is consequently being paid to sand control. Other new developments are also affecting the sand picture of which the ever-present pressures for more economy are only one.

Sand is the base of most foundry operations. Its preparation and control are vital to casting quality. In order to have better control of quality a more uniform sand must be delivered to the muller. For the foundry of tomorrow many developments are already underway to control sand better.

Since foundries are finding a common base sand can be used for both cores and molding, the reclamation of core sand and sand freed from the castings at shakeout is becoming an increasingly profitable investment.

In automatic systems less labor is involved, less storage and dumping area is required and the sand can be reused many times. Foundries with a high ratio of cores to castings are finding a continual improvement in present reclaim methods. Advances in such systems will make units available to small foundries and the designers of new foundries will take this into consideration.

Even though initial investment in a sand reclamation system is substantial, subsequent savings are often high and the entire unit can sometimes be amortized in six months to two years. Modern reclamation equipment is capable of producing reclaimed sand with a quality comparable to new sand and suitable as an addition either to molding sand, facing sand or core sand. Reclamation cost is often accomplished for $1 per ton or even less and the economics of today's foundry operations means more reclamation tomorrow.

Consistent casting quality is a function of adequate mixing and control of moisture and other ingredients. Suitable weighing facilities and automatic moisture control are an inevitable part of the foundry of the future. Exact control must be achieved by instrumentation. Lower casting rejects will pay for such installations in a short time in most foundries.

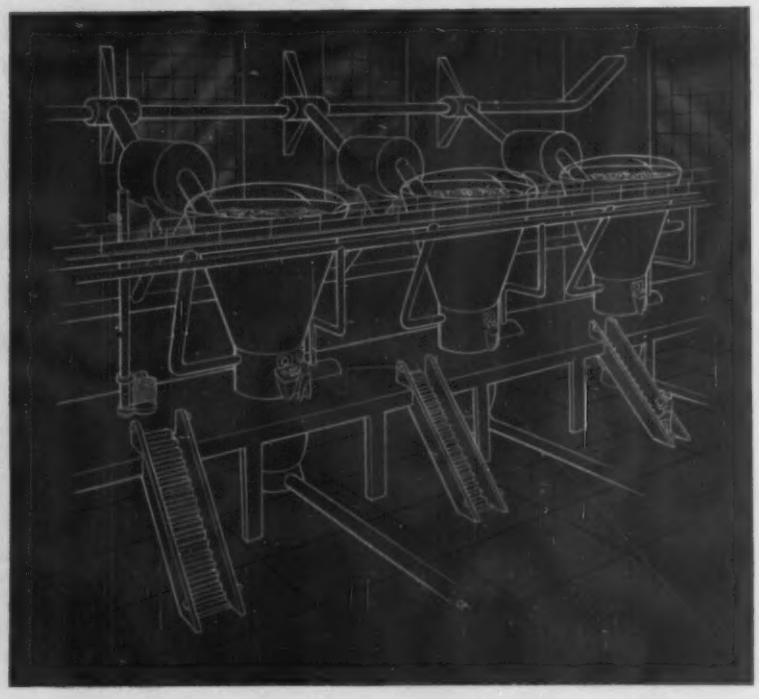
Standardization of grain sizes and shapes, bond and water are all part of the trend. Best molding demands standard mixture limits. These standards will be worked out by research and adhered to rigidly.

Continued research on clays, binders and additives will produce molding sands capable of ramming to a higher density and which can be controlled to precise, predetermined limits.

Research is still in its infancy on the possible use of inorganic materials as binders for molding and core sands. Continued development and use of inorganic binders will alleviate the problem of venting, since the new binders will produce little or no gas. Molds and cores will be produced which approach a gas-free condition.

These inorganic bonding materials will probably fall into categories such as soluable silicates and inorganic concentrated disperse-phase systems, such as hydraulic cements.

Sand enters and leaves giant conditioners pneumatically. Control panel regulates tailor-made mixtures for casting quality.



HEAT TREATMENT

Heat treatment has advantages but the goal is to use metals that don't need it.

■ Heat treatment for eliminating strains on intricate or complicated castings such as automotive blocks and heads made from high strength alloys is already essential and when properly applied has many advantages. Many foundries already heat treat all their castings to help machineability.

It is not necessary to heat treat all gray iron castings when the same result can be accomplished by using proper metal for the specific casting.

However, because of the different thicknesses of castings made in a production shop, it is often more economical to heat treat than to make up different metals to suit castings of differing thickness.

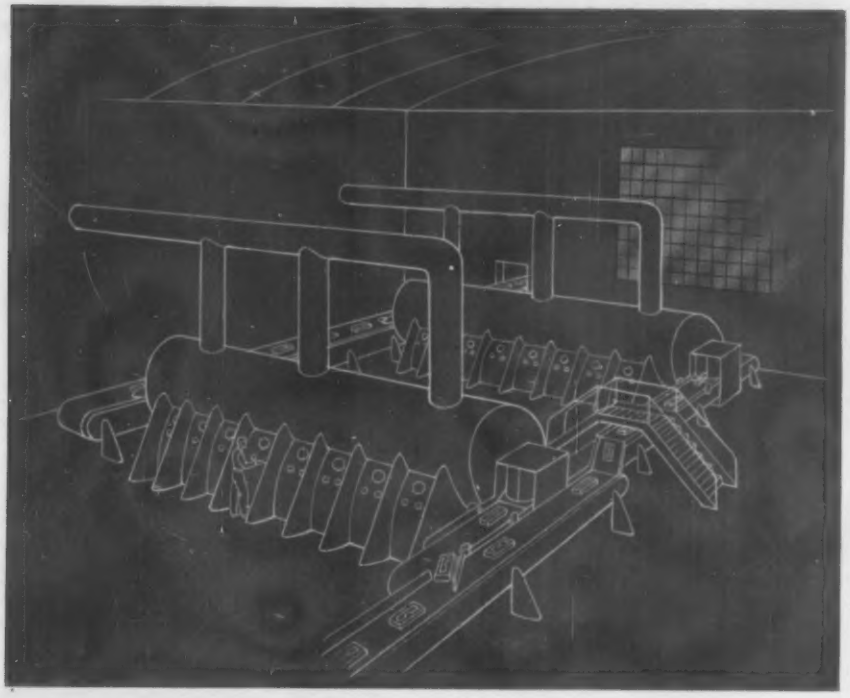
Since 1938 the time required to anneal malleable iron has been decreased from 60 hours to 23 hours by applying knowledge of the effect of small percentages of various elements on the graphitization rate of white cast irons. A further reduction in the annealing cycle is expected to reach approximately 15 hours and every effort will be made to anneal all malleable products in a 16-hour day, which would permit the continuous-flow principle of manufacturing to be applied more effectively.

Ultimately some authorities believe it will be possible to produce malleable iron without annealing.

For large plants and production, increased use will be made of continuous annealing furnaces. In small plants there will be an increased tendency to install one or two batch electric, or radiant-tube heated furnaces which may be used both for the annealing of standard malleable and the production of pearlitic malleable.

It is expected that pearlitic malleable will expand in use since it already has gained from 5 per cent to 20 per cent of total malleable production in only a few years. Pearlitic malleables do not replace standard malleables but are used in areas where forgings or parts machined from solid steel stock were used.

The universal adoption of short time heat treating cycles will appear in all steel foundries that control the temperatures of their furnaces. Use of delayed and interrupted quenching techniques for improving the toughness of cast steels will be adopted in the steel foundries.



Heat treatment is a continuous process here. Castings are fed into, through and out of the ovens by an automatic conveyor system. Atmosphere is controlled to prevent oxidation, scaling and decaburization. System could easily be used for annealing gray or malleable iron castings.

AFTER POURING

What happens to castings after they are poured? This may well turn out to be the most fruitful area for foundry economy.

■ Shakeout has been the hardest, hottest, dustiest, dirtiest job in the foundry and often it has been necessary to pay premiums to keep men on the job.

In at least one foundry today the entire shakeout job is being done by a man who pushes buttons and watches flashing lights. After shakeout, castings move automatically to the next operation.

New machines are due in the very near future which will release the sand by high frequency vibration. Such machines will adapt themselves better to dust and fume control and there will be less distortion of the flask and less breakage of castings.

From shakeout, the mechanized lines will take castings to cleaning and finishing departments and then to inspection and salvage rooms.

The time required in cleaning-finishing departments in the past has been equal to that required by both core room and foundry production departments. In the foundry of tomorrow a great deal more attention will be paid to time study and castings study and follow-up in these departments.

The high proportion of cleaning and finishing time has been caused by problems that suggest their own remedies.

Pattern work has allowed too large clearances between cores and prints. Castings have swollen out of shape due to improper molding. Metal temperatures have been hotter than required. Gating has been ill-designed and poorly planned and placed. Unnecessary risering has been performed to take care of blows caused by improperly made and vented cores. Cores have caused additional trouble where burned-on sand required extra cleaning and finishing.

These problems are not the faults of the cleaning room but the cleaning room will be a starting point from which more of the faults will be remedied.

Future foundries will spray many castings with a prime coat of corrosion inhibiting primer to reduce the amount of finishing now often required by purchasers due to corrosion and rust of castings after shipment. Foundries will be paid for such finishing—a charge which saves the customer many times its original cost.

Inspection standards will be increasingly formalized in future foundries. They will be more rigid, more precise, more clearly stated, so that inspectors will have a clearer idea of what to accept and reject. The standards will also apply to salvage so that inspectors will have a better idea of what may be salvaged economically without interfering with the quality of the end product.

As precision requirements of castings increase, inspection techniques must also grow more precise. There is a continuous improvement in methods and machinery used in inspection departments today. This trend will certainly accelerate in the next few years. Inspection must not only check the castings for structural defects but for conformance to specifications of size, strength and composition.

Radiography will expand. Wholly new methods of inspection will come into use ranging from sonic and ultrasonic analysis to inspection based on atomic techniques. Inspection will have to keep pace with the main trends in the casting industry.

The whole problem of inspection is intimately involved with that of quality control but it is hardly unique in that respect since so are all the other operations of the

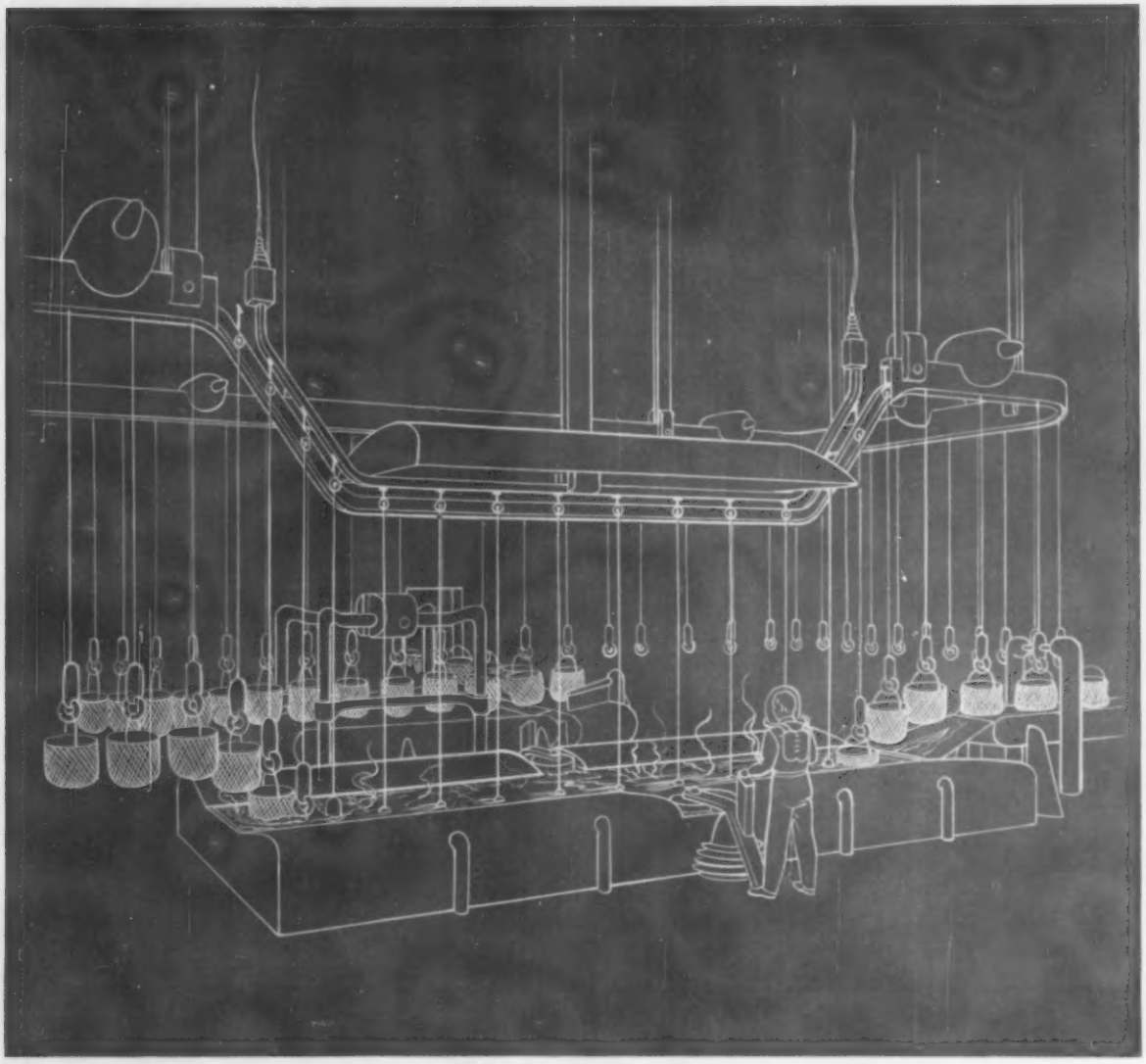
foundry. It is in the inspection department that the effectiveness of quality control measures can best be measured, however, and where many foundries of the future may establish quality control centers.

Inspection need not stop with castings alone. If foundries are to produce castings to predictable finish and dimensional accuracy the precision of pattern-making for both patterns and core boxes must be controlled. In the same way, the accuracy of flasks and the matching of cope and drag on flask sections must accord with the accuracy built into the patterns.

There will be tremendous strides in the whole inspection setups of foundries. Handling and cleaning methods will be revised to preserve the "as cast" finish and dimensions and the castings themselves will be treated as semi or finished machine parts.

In the actual inspection processes the castings so produced will be jig inspected and centered. Certain premachining steps will be taken by nearly all foundries instead of the few that are demonstrating the practicability of these methods today.

Electrolytic cleaning in a molten caustic soda bath can be faster, quieter than conventional cleaning. However, the ultimate goal may be to produce castings which require little or no cleaning—enther because of new methods or new molding materials. The field of cleaning and finishing needs study because of high man-hours consumed—usually equalling both core room and production hours.



THE FOUNDRY OF

■ The foundry of 1975 and beyond will be vastly different from the foundry of today.

It will be free of dust and fumes —one foundryman even predicted that it would be "hospital-clean."

Hot metal will still remain hot metal but even the workmen in adjoining areas will be protected by radiation screens and air curtains or similar devices. Foundry workers, it is proposed, will be dressed as other shopmen, for their jobs will be mostly those of pressing buttons, watching controls and observing processes. At least this is likely for production foundries which will be highly automated.

In the melting department, with comparatively low-cost electricity available from atomic plants, a greater use will be made of electric melting. Charging will be by remote control. Furnaces will be of a continuous type to produce large tonnages of uniform metal. The cold metal charge will be fed into the rear of the furnace or connected furnaces by conveying machinery and as it melts it will flow into a hearth or well, maintained at desired temperatures and analysis.

It is suggested that the metal will be delivered to the pouring area by remote control. On the other hand, some observers feel it is more likely that instead of metal being delivered to the molds, the molds will be delivered by conveyor to the metal and poured direct from furnace, hearth, or well.

A fixed amount of metal will pour automatically into the mold. If from a metal carrier the pot will automatically tilt, pour, reverse and, when empty, return to the melting area for a refill.

Other observers see greater use of "plastic" molds, permanent metal molds, ceramic molds, and certainly more extensive use of shell molds.

Molding machines will be completely automatic, with operators only as attendants. They will produce 250 to 500 molds per hour with much less manpower than required today. Flasks will return to the molding machines from a high frequency shakeout which has not impaired the fit of bushings and pins. They will be placed automatically on the mold machine. The machine will automatically fill, jolt and place the drag mold on a conveyor for core setting. An attendant may place an odd core or two that cannot at this stage be positioned in the complete assembly of cores. But, in most cases, the cores will be a unit and a fixture will lower the cores into the mold, retract, and the mold will continue on its way. The cope will have been waiting for its appointed time to lower over the drag—automatically clamp and enter the pouring area.

Cores will probably be made in the molding department using the same sand. They will proceed to the molding line by conveyor to be placed on the assembly machinery.

A shell molding division will be in operation, with a battery of machines, blowing the sand into fixed cavity molds, curing and releasing the molds to a conveyor for core setting and cope closing by the next machine. They will continue on a pouring conveyor. After a cooling period the molds will open and the castings will be ejected onto a conveyor carrying them to the cleaning room. These castings will be free of fins and dimensionally alike, requiring little work in the cleaning room.

■ How much of all this is a dream, and how much based on reality?

First is the indubitable fact of automation.

Mechanization removed the need for man's muscular power. Now it appears that automation is going a step further by removing the need for or replacing man's sensory apparatus.

The concepts behind automation in the foundry as elsewhere extend beyond mere machinery and processes. They affect all production from the conception of the product at the engineer's drawing board to warehousing of the finished item.

Often the process of replacing a man's sensory apparatus with a machine becomes prohibitively complicated and expensive. Many such problems, however, can be cleared up by designing products and processes with the idea that the operations will be performed by mechanical rather than by human manipulation.

Automation need not be a complicated series of machines. For the foundry, simplicity should be the aim. Some proponents of the complicated idea of automation seem to be going out of their way to scare the bentonite out of foundrymen.

While automation lends itself beautifully to mass production shops its main aim is not necessarily

TOMORROW!

Automation, continuous flow of work, increased precision, the high cost of man-hours, new metal technology are all powerful influences molding the future.

high production but to increase production per man.

Regardless of the extent to which automation is installed in foundries, operations will be designed to be more continuous in place of the present batch, or heat type operation. Virtually every one of the men who contributed to this section agree on this. New foundry layouts will follow the continuous operation principle as a means of making more economical use of the labor available.

It need not be assumed that automation will be confined to the large production foundries. While it is true that the larger foundries can afford to carry automation to its ultimate conclusion, the medium sized jobbing foundries and the smaller foundries can do a certain amount of economic automating.

Automation in fact has already obsoleted some of the mechanized foundries. It is part of the financial trend which requires an ever-increasing investment per employee to produce a higher quality of product to closer tolerances, with improved performance characteristics and at lower cost.

It is all part of the trend to change metal casting from an industrial art into a controlled science.

■ The manpower of the foundry of tomorrow is in for some changes too. While the population of the country will increase to over 200 million persons by 1975 in all probability, there will not be a corresponding increase in the available labor force. This means a greater demand for the available labor force and the probability of considerably higher rates of pay—possibly more than double today's rate per hour.

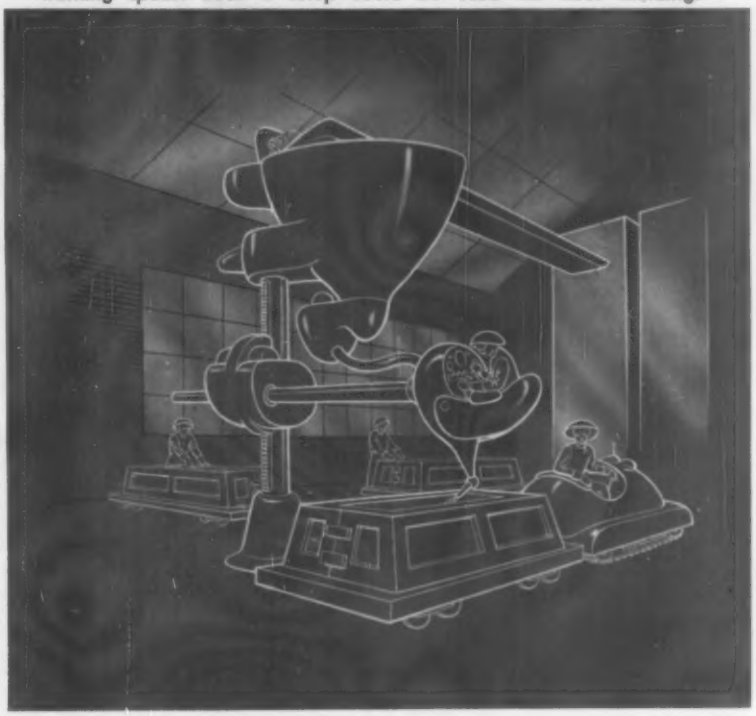
By 1975 the work week will probably drop to a 30 to 35 hours per week range in place of the present 40 to 45 hours per week.

Productivity per hour of labor will have to be increased accordingly, and this will require better training of the operators in the foundry. Thus, training programs for foundry operators will become increasingly important.

With more automatically controlled operations, highly trained maintenance mechanics will be required, and these will have to be trained. Supervisors will also require training in the proper use of automatically mechanized equipment.

Careful study of the design of the equipment going into foundries will

Equipment pneumatically or mechanically rams a large flask. Crawler tractor will transfer finished mold to furnace for direct pouring, than to outside cooling area where it will not obstruct working space. Such a setup could be used for floor molding.



be required, and engineers with a background of experience in the foundry facility field will be increasingly used.

Better training is also necessary in the sales field. New developments in metallurgy and the techniques of production have placed an increased premium on sales engineering to sell a casting to do a job—not just conversion of metal at so much a pound.

Selectivity of selling and specialization in production techniques, combined with training the engineer to design in order to take advantage of the casting process will all result in lower costs and better performance.

■ Here are some of the other ideas proposed for the foundry of 1975:

Castings will be cooled artificially.

The knockout operation will remove molding and core sands, gates, risers and fins automatically.

Cleaning will be greatly reduced, with everyone striving for a baby-skin "as cast" finish and little or no chipping or conventional cleaning being necessary.

Patterns will be made in tool rooms to a precision of plus or minus 1/5000 in.

The core box itself will become the core oven.

Products from the atomic energy field will find use in the foundry, probably in the sand preparation and melting divisions where they are already being tried.

Closed circuit television may find many uses in the foundry as it already is in the steel rolling mill field.

Patterns, flasks, coreboxes, core dryers and many other items of foundry equipment will be studied by the foundry engineers to make required improvements.

Materials such as foundry sands will be treated as engineering materials, and will be processed, handled, used and reclaimed with much more care than at present.

Inefficient producers of castings will find their markets more difficult to hold in competition with the efficient, low cost, new plants.

■ By 1975, an economy is predicted that will require nearly 2½ times as many castings as were produced in 1955.

Ahead of us, for example, is the new highway program—the biggest single construction program ever attempted, with $27 billion to be spent on over 40,000 miles of new roads in addition to the already existing program.

There will be many new uses for castings, not only in the fields in which castings are now used but on new devices to be manufactured in the future. Training the engineers now in school to be more castings conscious will contribute toward a greater use of castings.

Yet looking into a crystal ball has its hazards and obvious difficulties.

How will the advent of the gas turbine affect foundries, for example? It seems almost certain to come within the next few years. It will bring a requirement for both metallurgical and dimensional tolerances that most foundries cannot meet today. They will learn to meet them tomorrow; they will have to.

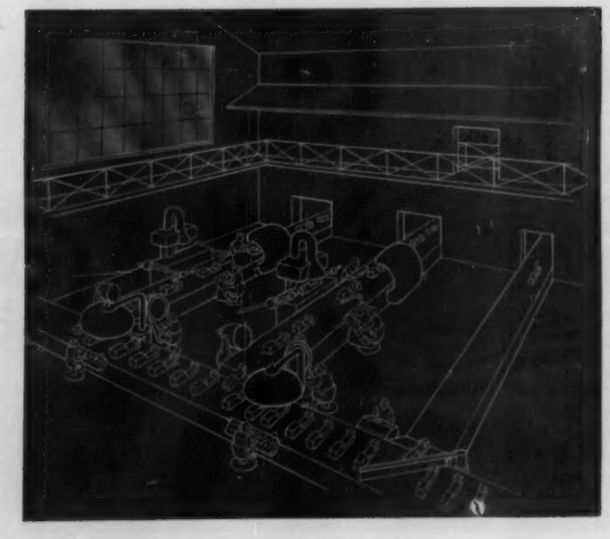
Will turbine blades be cast by present conventional methods which will have been made more precise or will there be a vast increase in investment castings, shell molding, metal molding and probably new methods not now generally known?

The science of the past 200 years has been largely a matter of analysis—taking everything apart to see why and how it works. Now we are becoming proficient in synthesis—putting the parts back together into new and useful patterns.

All this will change the foundry profoundly. Some of the ways in which it will change it are hard to classify. A modern die casting shop doesn't look like a foundry but it makes castings very successfully. Some die castings are made from metal which is nearly solid when injected into the mold. Does that make them forgings?

In the synthesis of the future, foundrymen will have new metals and alloys with new and unexpected properties. Even now, without synthesis, they have such new metals as titanium, which will add to the possibilities of the casting industry. New developments in copper-base, aluminum-base and magnesium-base alloys will expand the uses of castings in many fields. Pearlitic malleable iron, special purpose high alloy cast steels, ductile iron, the metallurgy of minute additions will add to the markets for castings.

Foundrymen of tomorrow ought to have an interesting time.



All castings are inspected by use of non-destructive methods. Radio-graphic, fluoroscopic, x-ray, fluorescent penetrants, ultra sonic and magnetic particle inspection methods are used. Remote control takes rejects off line.

C. V. Nass / *Vice-President*
Beardsley & Piper Div., Pettibone Mulliken Corp.
Chicago

HOW TO GET YOUR SHARE OF AN EXPANDING MARKET

Why the answer is "yes" to four important questions

■ A rare and precious material is being mined in every state in our country today. The material is scarce and the market is tremendous as few industrial concerns can survive without it.

It's a rental market, for this material can't be purchased. Rental cost at the mine—in an unrefined state—is approximately $5000 per unit per year and some 5300 of the nation's industries are entering formal bids for this material, competitively and earnestly. They are bidding not only for their growth, but for their very survival.

This precious material is, young college graduate, more especially, the engineering graduate. The mines are the colleges and universities of our nation. This year, some 1800 of these institutions will graduate approximately 300,000 students. Fewer than 35,000 of these graduates will be engineers and fewer than 30,000 will be available to industry. The balance will continue on to higher education.

As these engineering students near graduation, the work of some 20,000 professors and associates, who have trained these people, will near completion, in so far as this year's group is concerned. The work of American industry, in first attracting and then utilizing these graduates, will just begin. It is in this work that the castings industry —especially that major segment comprising the small and medium size foundries—has lagged badly behind other industries.

Industries and industrial concerns vary considerably in the appeal they engender in the young men graduating from our colleges and universities. Unfortunately, the foundry industry has always been notoriously poorly publicized. The glamour, the excitement of the industry, through extremely real to those within the field, is obscure to non-foundrymen and even to top management of some organizations operating captive foundries.

In my own case, it wasn't the "romance" of the foundry that attracted me to a life within the industry, a life that has been basically rewarding and satisfying. Having graduated as a chemical & metallurgical engineer, I was attracted by the opportunity to work on two interesting research problems. In the early twenties my interest was in the problems at hand, not in the industry as such. The glamour of the foundry industry did not register until normal developments in the research problems required close contact with plant processes and control. Only then did the foundry exert on me—as it invariably does on all of us—its almost magic retaining force.

We must not let this force which so strongly grasps all of us in the industry blind us to the problems facing us in attracting young engineering talent.

The foundry industry's problem in attracting this talent is unique for the foundry industry is unique. First of all it is a basic industry with an output of over six billion dollars annually; yet the average unit-plant size, in number of employees, is only 69.

The industry spends over a million dollars an hour for materials and supplies. Yet until comparatively recent years there was little or no interchange of information regarding equipment or processing conducive to the wisest spending.

Unlike many other essential industries which are based wholly or largely on science, our castings industry, one of the oldest, is based on art—art drawn from the great civilizations of the past. It is only in recent decades that science has been at work within the foundry industry. Certainly those industries based on, and emanating from, science will have greater romantic appeal for youth in this highly technical age. Then too, these other industries have had the acceleration provided by heavy government subsidy. The foundry industry has never been subsidized.

These new industries born of science and nurtured by the demands of wars have shown tremendous growth. They have a dramatic appeal to young engineers. Since that day in December 1942 when Dr. Enrico Fermi consummated the world's first controlled nuclear reaction in a university of Chicago squash court, atomic industry has mushroomed in scope and size. Today, few older industries remain unaffected by this still infant one.

In a like manner, the automotive, the aeronautical, the electronic, and many other industries have grown in size and appeal in spans of time so short that they are but as moments in the antiquity of the metal castings field. Against this background of competition for young engineering talent, where does the foundry industry stand today?

Consider this problem from four standpoints.

1. Does the castings industry really need engineers?

2. Does the young engineering graduate represent a sound economic investment for the foundry, especially for the smaller or medium size plant?

3. Does the foundry represent a sound economic investment for the engineer?

4. What can be done, especially by the smaller plant, to attract engineering talent?

The need of the foundry industry for young engineering talent is real and immediate. Filling this need is essential for survival. For hundreds, even thousands of years, founding was an art. In ancient days the so-called secrets of the art of metal casting were jealously guarded family treasurers and in more recent times, were equally well-guarded company secrets. The mysticism and secretiveness that surrounded foundry procedures

The castings industry spends over a million dollars an hour for materials and supplies.

were not conducive to research or development, so these activities were hampered. As a result, other processes captured a considerable portion of the castings market.

The introduction of the power forging press in the United States in the 1880's, and the developments that followed, represented the first real challenge to metal castings. The development of the first triple acting hydraulic press capable of making stampings from strip or bar stock, in the early 1890's, sounded another challenge. The first patent on resistance welding in 1888 and subsequent developments in that field offered still further challenge.

The foundry industry failed to meet these challenges. No new developments were forthcoming within the industry to counteract the rapid developments in competing fields. In each case a segment of the foundry's business was lost. As these other processes became more fully developed, the loss of market became more severe. In the foundry industry, labor costs continued to rise and we were guilty—not only of letting our costs get out of line—but of not knowing our costs. Further, we gradually lost our artisans and did not develop new skill to replace the loss, much less provide for the normal requirements of industry expansion.

Only in the past few decades have we thrown off the yokes of secrecy, apathy and lethargy, and started to progress in an energetic, resourceful and aggressive manner. One of the important reasons for our new-found progressiveness has been the gradual infiltration of engineering ability into the industry.

This engineering talent has provided the foundry new approaches to old problems and brought to it the ability to analyze the problems from more than one point of view. It was instrumental in correctly analyzing the problem and pointing the way to its solution. It changed the concept of metal casting from a narrow, sometimes blind, approach to a broad scientific one. The industry, basically rugged and resourceful, has responded to this new leadership and to the scientific approach in an energetic manner.

But, being alert to our problem and aware of the path toward solution is only half the battle. Each day brings new demands for an improved product and with it the necessity for improved product control. Competitive processes have not been and are not now standing still. The challenge of competition can only be met through more scientific operation, through a reduction of costs to more competitive levels, and, most important, through the development of new and better processes and equipment.

As a case in point we might consider the growth of the aluminum industry. It is not difficult to understand why that industry's prospects were poor, back in 1860, when commercially produced aluminum ingot sold for $18 a pound. New processes and scientific operation have reduced that cost to approximately 24½¢ a pound today and the future of that industry is as bright as its product. We might well contemplate the position of that industry if it had plodded along without the catalytic action of engineering and technical talent.

Obviously, if the foundry industry is to compete with other industries successfully, engineering talent will be required in ever increasing quantities. We must have engineers for research and development in materials, in processes and in equipment. Engineering talent in our purchasing departments is an advantage in translating this research into intelligent purchasing. The same talent is essential in our production departments if process control is to keep pace with process development.

This applies all along the line—in process engineering, in product engineering, in supervision, in sales, and in the development of top management.

Thus, the need is here, and with each new development in the foundry industry, the need will become greater. Take shell molding. In terms of engineering talent, the development of the process was only the beginning. Since that development, millions of engineering hours have been required to adapt the process to production, to develop practical equipment for the process, to develop successful sand practice, pouring procedures and cleaning methods, to work out production and quality control procedures, and finally to acquaint purchasers with the proper application of shell-molded castings.

If we are to keep pace, we must depend primarily on engineering skill. A major portion of this talent must be new talent attracted from the college campuses. These young engineers represent our opportunity for advancement.

In deciding whether young engineers represent a sound economic investment for the foundry industry, we may well study the impracticability of our alternate course. Can we afford not to attract and utilize young engineers? It would cost far more to stay out of the engineering talent market than to enter it. This cost would be measured in terms of lost markets, as competitive processes move into existing as well as new, metal casting fields, or as castings price themselves out of some markets because of our failure to control costs.

This reasoning applies to small as well as large foundries. Large plants have utilized young engineers for many years. In many of these large foundries, comprehensive training programs have been developed. The young engineer is often utilized as a departmental foreman, while he is on his way up. But realistically, we must consider the problems of the smaller plants, too, for of the 6208 foundries in the United States and Canada, 84.2 per cent employ fewer than 100 men.

Few of these small plants can afford a program with a number of young engineers on a continuous "in-training" status. Yet, if they are to compete successfully with larger plants, it is essential that they, too, devote effort to developing fresh engineering talent. For these plants, the answer may well be a limited program with a personal touch, where one or two young engineers are guided carefully through training stages as they work in various foundry jobs. It is essential in such an arrangement that the person in charge of these young engineers be well qualified and able to sustain their interest until the industry exerts its own magnetic influence on them.

It's Good for the Foundry

In terms of economic soundness, the advantages of investing in young engineers may be roughly summarized as follows for the smaller foundry:

1. The young engineer brings a background of engineering information and knowledge. Though this is naturally limited, at least he posesses the knowledge of where and how to obtain further sound information as occasion arises.

2. He has a broad general background of engineering skills in chemistry, metallurgy, engineering calculation, engineering analysis and others that, with proper guidance, may prove of immediate value to the small foundry.

3. He has a great capacity for learning and is able to quickly understand the significance of the various phases of foundry operation, thus being able in a minimum of time to offer suggestions for improvement in methods.

4. Even in the small shop, he may well be of immediate value as a technician or process control man, although it must be recognized that the first several months of employment are basically a period of orientation and assimilation without full productive benefit to the foundry.

5. He represents potential leadership for the foundry in research, production, engineering, and sales.

6. Most important, the need of developing management is of as great, if not greater, importance to the small foundry as to the large organization. We must develop, not only for replacement, but to meet the additional requirements in the knowledge and understanding needed in every management position today. Management problems are becoming more and more complex. The need for managerial ability is increasing faster than business growth because of technical and scientific developments and the inherent complexity of business and government relationships. The small foundry requires broadness and scope in each management position. The young engineer represents this potential management ability.

Even if it is fully established that the young engineer is a sound investment for the foundry, that is only half the picture. To fully understand the problem we must see how the foundry industry looks to the young engineer about to enter industry. He is making an investment of the years and money spent

for an education in his first, very important, venture in industry. Does the foundry represent a sound investment for the young engineer?

Good for the Young Graduate

Let us examine the advantages that the foundry—even the smaller foundry—offers the young graduate.

1. The revitalized foundry industry is expanding—in size, in scope, in process.

2. The industry has a relatively low ratio of college trained to non-college men, providing great opportunity for trained men. In recent years college-trained men have advanced rapidly in our industry.

3. There is ample opportunity for all types of skills in the foundry executive field. Research, management, financial, all types of engineers are needed.

4. The foundry industry is basic, mature, offering stability of opportunity and employment.

5. Even with this maturity, the industry has youth and vigor. New processes, new equipment, and new concepts are constantly entering the picture.

6. The foundry industry is now extremely alert to its need for college-trained men. Such "new blood" is courted and well-received—no longer scorned by the practical foundryman.

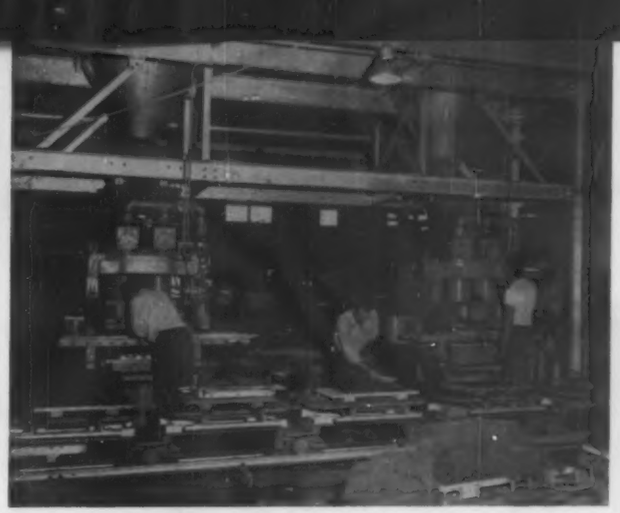
7. The industry offers a continual challenge to engineers. Even well-established processes are constantly undergoing change. While some segments of our industry are at the threshold of mechanization, other segments have gone on to automation.

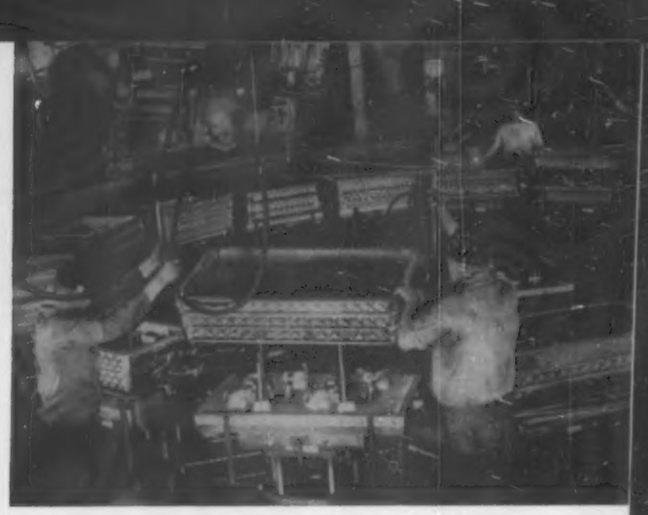
8. The rate of compensation and the rate of advancement are well above average. Many top executives of nationally known firms started in the foundry division of their companies.

9. Progressive foundry organizations are not concentrated in particular areas (as for example are plants in the aircraft industry), but are located throughout the country. The foundry industry will continue to be made up predominantly of small units serving every area of the country and practically every segment of our economy.

10. The foundry industry is alert to its faults and is constantly trying to improve working conditions.

11. New, highly scientific fields are partially dependent for further progress on developments in the metallurgical and metal castings fields. As an example, new high temperature alloy castings are essential if aircraft speeds are to be further advanced. Engineers with a sound understanding of metal castings will be essential to serve the atomic, aeronautic, and other industries.





Challenges arise constantly with even well-established processes undergoing change continuously.

But We Have Shortcomings

These are points in our favor in attracting new engineering talent. But the young graduate will look at the other side of the ledger, too. We must recognize some of our shortcomings from the young engineer's point of view.

1. As a rule foundries have not yet reached standards of safety and housekeeping set in other metal working industries, though some foundries have set standards that equal or surpass those of other fields.

2. If the young engineer seeks employment in a "glamorous" industry he might find that the public does not recognize the "glamour" of the foundry.

3. There are relatively few sales positions for engineers in the foundry, though there are many in related fields.

4. There are few soft spots. The industry's opportunities are only available to those who will work for them.

5. Only a few foundry organizations have a planned program of advancement for engineers.

6. In general, advancement is not scheduled, it is merited.

7. Comparatively few foundry organizations offer planned bonuses or retirement benefits.

8. Few foundry organizations offer opportunities for continued formal education as do some organizations in other industries.

9. In general, only the larger foundry organizations are able to absorb the young engineer whose abilities and aptitudes are exclusively in the research field.

10. Only a few large foundry organizations are able to offer the young engineer an "engineering atmosphere" in which to work, that is, a chance to work and consult with other engineers.

A few of these points would seem to give the large foundry an advantage over the smaller one in attracting young engineering talent. This should not discourage the smaller plant, for there is one very important point in their favor. Many young graduates have an outright preference for the smaller company, that will rule out the big plant. They prefer the advantages of closer personal contact with and more personal recognition from top management.

What can the foundry industry do to attract more young engineers?

The Foundry Educational Foundation represents a most worthwhile forward step. After eight years, we are in a position to appreciate the great foresight of the men who conceived and established FEF. Though still in its infancy, its contribution has already been sizable, with well over 1200 graduates placed in foundries or allied firms. It represents our best effort to date in the engineering talent market, and we industry people must continue to support the foundation in every possible way. Contributions of time, equipment and funds will continue to be essential.

Just as important is that steps be taken to improve the impression that the public holds of the foundry industry. Efforts to do a better publicity job should be stepped up. Too few of our larger firms have made exemplary films and publicity material available to schools and the public. Not enough newsworthy information on foundry improvement has been released to newspapers and other molders of public opinion.

And here is where the smaller plant, too, can make a real contribution. High school and trade school classes can be invited to see our plants and to learn how castings are made in a modern foundry. These youngsters will be impressed when they are told of the essential part played by castings in the most modern fields.

Most important, we must never cease our efforts to make the foundry a better place in which to work.

All indications point to a gross national product of 600 billion dollars by 1975. If the foundry industry keeps pace with our expanding economy, our industry's share of that market will be ten billion dollars. With a broader base of engineering skill and talent even that goal may be easily exceeded.

This address was presented at the 1956 College-Industry Conference of the Foundry Educational Foundation.

WE CAST STEEL IN

We get design flexibility . . . precision at low cost on less than 500 castings . . . need only short lead time

Typical castings of type and size currently being produced in ceramic molds.

■ Quality and cost advantages of Lebanon Steel Foundry's Ceramicast process (used under a licensing agreement) can be evaluated now after a year of production. We can also report on application of the process to the problems of design and materials engineers.

In the process,* a mixture of fine and coarse sillimanite, liquid hydrolyzed ethyl silicate, and a liquid catalyst are mixed in quick fashion and poured over a prepared pattern. The mix subsequently sets in a few minutes to form a gel and then a rigid mold. During the gel stage the mold is moderately flexible which facilitates stripping from the pattern.

Following stripping, the mold is flamed wth a torch, assembled, fired at red heat in a furnace, and is then ready for pouring either while still hot or later when cools, as requirements dictate. The chemical set of the mixture involves two distinct steps: during the life of step one the mold retains a flexible quality, and as step two occurs a complete rigidity ensues.

■ **Advantages.** The process has significant advantages for producing steel castings of medium and small size. Thin sections down to $\frac{1}{16}$ in. can be cast. When we go after thin sections we can use molds as hot as 2000 F. Gating systems are extremely important in running thin sections. Higher metal temperatures are, of course, helpful. The difference in various alloy fluidities is to be considered. We have not as yet employed pressure and centrifugal systems.

Surface smoothness is quite evident. We are claiming 125 microinch finish and better. This quality depends on many things, among which are hydraulic head, fineness of refractory grain, metal and mold temperatures, section thickness, and metal fluidity.

Casts More Complex Designs

Design complexity far exceeding conventional sand castings is possible. The material is relatively strong, smooth, and yet flexible, making possible release from patterns with no draft and producing a mold with faithful registration of fine detail.

Tolerances from ± 0.003 in./in. are possible where the measurements are made on parts cast wholly in the same section of the mold. An additional tolerance of 0.006 to 0.010 in. across the parting line must be accommodated.

The good tolerances and smooth casting surfaces obtained indicate substantially less machining than is

*"*Investment Precision Casting Without Expendable Patterns,*" A. Dunlop, AMERICAN FOUNDRYMAN, June 1954, pages 64-69.

CERAMIC MOLDS

D. C. Ekey / *Research Director*
Lebanon Steel Foundry
Lebanon, Pa.

E. G. Vogel / *Research Engineer*
Lebanon Steel Foundry

necessary with conventional sand castings.

Low pattern cost is a definite factor when the number of pieces to be cast is less than 500. This figure is not the result of an accurate survey but rather a result of cursory study and would, of course, be affected by many factors.

Lead Time Short

Simple pattern construction and molding precedure insure short lead time. Patterns of bulky design may be made in wood and as such are suitable for short runs of 50 to 100 molds. The best functioning patterns are of mounted design, cast in aluminum and polished.

The ceramic molds permit the use of a great variety of steel alloys without difficulty. Occasionally we encounter the measle defect in the 12 per cent Cr steels.

The process is adaptable to a wide range of casting sizes up to weights of several hundred pounds. As the casting weight increases and design becomes more massive, the surface loses smoothness.

The internal metal sections are unusually clean and free of any gas and other inclusions. This is directly due to the extreme resistance of the mold material to spalling or erosion during the casting of molten steel.

▪ **Disadvantages and Limitations.** While the process has many significant advantages, it also has its own inherent limitations, and the design and materials engineer must carefully evaluate these limitations so that he may make the best possible use and application of the process.

Since the process invades the field of precision casting, a deciding factor in selection or rejection of the process is the number of pieces to be cast from one design. When this quantity is approximately 500 or less, the short lead time and low pattern cost of the Ceramicast process give it definite cost advantages. As quantity requirements exceed 500 or more, then the high first cost of competing precision casting processes is more easily justified. It should be pointed out that the process has very definite advantages in prototype work, where design changes can be made quickly and inexpensively.

The accuracies possible with the Ceramicast process must be qualified when compared with those produced by the lost wax method. The dimensional history of the Ceramicast product at Lebanon is competitive with the lost pattern type in some cases and definitely noncompetitive in others. For large quantities of small intricate parts, the lost wax process would probably be selected. For components up to about two pounds in weight, either lost wax or ceramic mold casting might be selected. In large sizes, however, the new process without expendable patterns has the advantage.

While it is conceivable that the Ceramicast process is adaptable to almost any steel casting design, there are certain designs which do not lend themselves ideally to the production concept. These include rangy flat components, relatively large print areas, fine or complex core placements, and deeply recessed mold pockets. Although it is possible to transcend all of these limitations in the process, the high labor cost involved because of extraordinary attention or supervision makes such production impractical in all but isolated cases.

▪ **Production and Materials Costs.** The nature of the process does not lend itself to high speed production. A typical time analysis of the molding of a simple coreless (one to ten pound casting) mold is as follows:

	Man Minutes
Pattern cleaning	1.50
Mixing slurry	2.00
Pour and set	1.00
Pattern draw	1.50
Flaming	.75
Closing and luting	3.00
Fire	.50
	10.25

This indicates we can get about five to six molds per man hour.

In the category of materials, we are confronted with high costs. A listing of the major materials and their cost per pound is as follows:

Hydrolyzed ethyl silicate	$0.46
Catalyst	0.03
Sillimanite	0.075

Calculations show the following mold weight and volume costs:

Dry mold cost/lb.	$0.19
Dry mold cost/cu. in.	0.012

A comparison of the Ceramicast process with green sand, investment

Preparing the mold mixture; ceramic used is sillimanite.

Clean pattern gives smoothest casting, best results.

Mixture pours like cake batter.

Molds are torched before cleaning and baking dry.

Sand cope, ceramic drag are used for some castings.

casting, and shell mold casting is shown in the table.

■ **Applications.** For service in the aircraft field, jet engine manifolds and blades have been produced from highly alloyed materials while bearing supports and elbows have been cast from low alloy steels. Other aircraft components include landing gear struts, shock absorber housings, brake backing plates and certain structural elements where it is possible to use ferrous alloys.

Make Turbine Parts

Engine applications also include blades and vanes for gas turbine vehicular propulsion, steam turbine guide vanes, and diesel engine heads, the latter produced from heat resisting alloys.

A variety of industrial applications includes stainless steel pump impellers and filter press frames produced for service in the process industries, bottling cap guides, and drop forging dies. Among large parts which have been produced are chromium steel glass molds for 21-in. television tubes. These weigh as much as 300 lb.

Extrusion die inserts of a cobalt base alloy have been highly successful in the extrusion of copper, the highly alloyed inserts have served for the extrusion of more than 2000 billets, compared with a previous limit of about 250 billets with stainless steel. Dies of chromium steel produced for plastics injection molding have also given excellent results.

■ **Summary.** The Ceramicast process has a very definite place in steel casting design and production. As a process it offers quality advantages in the end product substantially exceeding those of conventional sand castings but generally less than those offered by precision methods. The process is adaptable to a wide range of applications requiring close tolerances and dimensional accuracies at lower costs than precision methods where quantities do not exceed approximately 500 pieces per design.

The process may, be considered an important supplement to existing methods. It adds much needed flexibility to casting design and production by offering a quality range between the limitations of conventional sand castings and the unique accuracies of precision castings. It provides many advantages of the latter at lower cost.

This article, based on the paper *"The Ceramicast Process for Steel Castings,"* will be presented at a Steel session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

CERAMICAST PROCESS COMPARED WITH GREEN SAND, INVESTMENT CASTING, AND SHELL MOLD CASTING:

Casting Requirements	Ceramicast Castings	Investment Castings	Green Sand Castings	Shell Mold Castings
Surface smoothness	80-125 micro-in.	40-125 micro-in.	200-500 micro-in.	80-165 micro-in.
Intricacy	Excellent, approaching but not equalling precision castings	Excellent	Fair	Excellent but not equal to Ceramicast
Thinness of metal sections	Excellent	Excellent	Fair	Good
Tolerances	Good to excellent	Excellent	Fair	Good
Machining costs	Machining greatly reduced, sometimes but not always eliminated	Minimum machining required	Relatively high cost	Slightly higher than Ceramicast
Lead time	Very short lead time	Longest lead time	Shortest lead time	Long lead time
Adaptability to various sizes	Casting size not restricted except above 100 lb for the top size of the casting	Restricted to small castings	No size limitations	Comparable to Ceramicast
Adaptability to various metals and alloys	No limitations	No limitations	Almost no limitations	Almost no limitations except low carbon steels
Pattern costs	Very low cost; jobbing wood or metal patterns may be used	Very high cost	Very low cost	Very high cost but less than investment castings
Prototype adaptability	Low cost	High cost	Not applicable	Generally, not applicable

This table is compiled for comparison only and is not to be considered absolute. For exact data, it is necessary to consult the foundry engineer on the particular design involved.

HOW TO THINK ABOUT COSTS

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Terre Haute, Ind.

These basic concepts help any small or medium shop set up its own cost system

■ Every cost procedure must be tailor made. This is easily done provided basic cost concepts are kept in mind. If they are not, it is possible to develop reports, charts, schedules, budgets, and an almost unlimited analysis of operating activity to such an extent that confusion results.

The end point of a cost system should be a formula that will develop a cost, per unit of weight or per piece, of a casting from an individual pattern that reflects a sound basis for determination of its selling price. The obsolete thinking that we are selling tons of castings must be replaced with the knowledge of how many dollars of labor, conversion materials, taxes, insurance, depreciation and other overhead costs we are selling. To do this, it is necessary to know the cost activities required to produce the casting, and the cost of each activity.

The following terms will be used repeatedly:

Cost Centers are the points of concentrated effort necessary to produce castings.

Cost Elements are the costs of the activity of each cost center.

Cost Formula reflects the unit results.

It is, of course, not practical to determine the exact cost of a given casting. All castings being produced from different patterns at the same time have an influence on the production cost of any given casting in the group or pattern mix. Any change by addition or deletion of patterns in the pattern mix will change the actual cost of the individual castings. However, the cost formula, properly developed and applied, will reflect a reasonably accurate cost if there is not a drastic change in pattern mix between the period of basic calculations and time of production. Any major change that affects the operations will require a new analysis of costs.

In the development of a cost formula, an analysis should first be made of the plant production methods. This will reflect that all castings require certain facilities and in some instances only particular facilities. The core room, for example, may have floor blowers, bench blowers and hand operations as direct labor centers. If so, there would be three cost centers. Sand preparation and baking could be an additional cost center, or even two if desirable from cost control analysis. This same procedure should be followed throughout the plant.

Remember: different processes, separate cost centers; different process methods, added cost centers.

The final result leads to a chart of accounts that will channel costs of elements into groups whereby they can be summarized into cost centers. In accomplishing this, due consideration must be given service departments and expenses that are general in character. I recommend that general expenses be separated between expenses that are fixed and variable; also, those caused by payroll or other activities. Each of the general classifications would be considered a cost center. Table 1 illustrates an account numbering system that standardize classes of cost elements.

In addition to an accounting procedure to funnel expenses to the proper cost center, statistical information must also be accumulated to reflect activity of production. An analysis of the cause of cost is necessary to determine what the basic cost units should be. The molding department probably would reflect as a minimum mold sand weight, mold metal weight, and molding direct labor dollars. The method of calculating payroll must be considered when making this analysis, as well as the location of the work. Some foundries remove sprue from castings in the molding department, whereas others have a separate department for this operation. The objective of this determination is to have a vehicle by which costs can be applied to specific jobs for only those expenses incurred in its production.

There has been considerable discussion regarding allocation of metal costs to specific jobs because of variations in yield. Many hold to the group using the so-called yield table for accuracy. However, I believe the same results can be obtained by a single calculation whereby the variation is absorbed in the cost unit based on mold metal weight.

The theory is sound that metal costs the same per weight unit in every casting made from the same metal composition regardless of yield. The cost variation due to yield is costed to the particular job based on metal in the mold. This is accomplished by calculating the cost of metals used and arriving at a unit price of given dollars per unit. Using this price, a value is placed on saleable castings produced. The difference between the metal value of saleable castings produced and cost of metals used is the variable and becomes part of the cost distributed on the basis of mold metal weight.

Distribution of general expenses

TABLE 1 . . CLASSIFYING ACCOUNTS FOR FOUNDRIES

Chart Scheme	
Department	1000
	2000
	3000
Cost Centers	100
	200
	300
Direct labor	10
Indirect labor	20
Delay time	30
Allowances	31
Overtime premium	32
Shift differential	33
Supervision and clerical	40
Supplies	50
Maintenance labor	60
Maintenance supplies	70
Examples	
Department two—molding	2000
Cost center one—sand preparation and supply	100
Overtime premium	32
Account number	2132
Department three—core	3000
Cost center three—blower	300
Direct labor—painting cores	11
Account number	3311
Department three—core	3000
Cost center four—baking	400
Maintenance supplies	70
Account number	3470

is of considerable importance. The total dollar costs of this group are generally large, and care should be taken in properly directing the values to the cost centers used for formula purposes. Payroll costs such as labor taxes and labor insurance require an allocation to cost centers based on labor charged direct. This distribution must include all cost centers that have accumulated charges for labor expense.

Maintenance costs are sometimes difficult to determine in small foundries, especially if direct labor operators are permitted to make minor repairs. The chart of accounts should provide for maintenance costs, both for labor and supplies, for each cost center. Proper distribution will then account for these costs insofar as direct charges are concerned. However, some maintenance costs are general in nature such as the maintenance supervisor, building repairs, etc. These should be allocated or distributed to cost centers on an applicable basis — maintenance charged direct, by floor area, or whatever basis seems justifiable.

Depreciation, if at all possible, must be charged to each cost center based on buildings and equipment located in or required by the cost center. In relatively recent years, consideration has been given to using depreciation rates applied to replacement values for cost accounting purposes. This is due to the deflation of the purchasing dollar and the realization that depreciation reserves accumulated in the past are insufficient to cover replacements in the present or future. Unless this theory is followed, replacement of your equipment will be partially paid out of profits if the dollar continues to be deflated. Also, the older your equipment is, the greater the demand will be on your profits. If an appraisal of buildings and equipment is maintained currently, the replacement value is readily available.

General plant overhead costs that cannot be allocated to specific cost centers by a controlling factor should be distributed on the basis of total costs accumulated by cost centers. Administrative and selling expenses should be applied as a cost formula rate on the cost of converting metals to castings, that is, the total cost of production minus metal cost.

The actual cost to produce a given casting does not vary due to variations in volume of total production. Calculations will reflect that the cost *does* vary with production volume unless overhead expenses are applied in the development of the cost formula on a normalized basis.

The basic concept of normal overhead is that the actual cost is not necessarily the best criterion of the true cost, but that the proper amount of overhead expense to be charged in your formula is the amount incurred at normal capacity. Two elements are thus involved: normal production, involving a determination of normal capacity; and normal expense, involving a computation of normal burden rates.

The analysis given in Table 2 is presented as a theoretical normalizing factor. It presumes a six-month period is to be used in the development of a cost formula. The results indicate that only 91 per cent of fixed overhead costs should be absorbed in the formula in order that calculated unit costs will be normal. If the calculation reflects 105 per cent, fixed overhead would be increased and cost savings would be retained instead of passed on to the customer through undercosting.

It should be understood that the calculation can give whatever result management desires. The illustration indicates that 50 molding stations were used as a normal operation. It does not necessarily mean that only 50 stations were available. Management must determine how many stations would be an overage or normal operation from which they would expect to make a satisfactory profit.

Other important operational activities to be considered in making an accurate basis for costing are:

- Castings produced for own use.
- Skim cores and furnace cores.
- Green sand cores.
- Returned castings, scrapped and salvaged.
- Order charge (short orders, production runs, repetative runs from single orders).

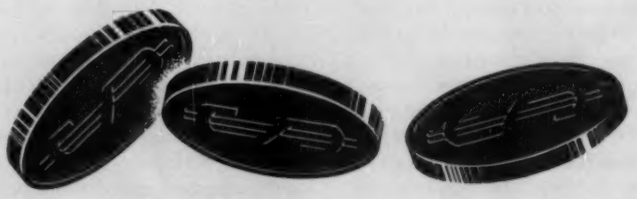
When we work up costs applicable to the centers of operation within departments, we have prepared the way for sound costs. This step is most needed in highly mechanized production shops but is also necessary in the small conventional jobbing shop. For both, it will provide tailored castings costs which include only elements required for production in the case of each pattern and will exclude costs for facilities not used.

TABLE 2 . . NORMAL OPERATING HOURS

Days per year		365
Less: Saturday and Sunday	104	
Holidays	6	
Vacation	5	115
Maximum working days		250
Standard work-day (hours)		8
Maximum work-hours		2000
Operational down-time	10%	
Major equipment maintenance	2%	240
Net annual scheduled hours		1760

Example

	Hours
50 Molding stations @ 1760 hours	88,000
6 Months basis	44,000
Actual hours worked	40,000
Normalizing Factor	91%



The suggestions made are applicable to the entire foundry industry. Certainly a knowledge of true costs, determined realistically, would be beneficial to all foundries, regardless of the metal used. Competition would be stimulated by confidence in costs and loss price-setting would be minimized.

The procedure opens up a field for cost control of which few foundries take advantage. Knowledge of cost of operation of production centers developed on a comparative monthly (or more frequent) basis will give management tools to work with. If a chart of accounts is developed to properly record classifications of labor and supplies, the suggestions are relatively simple to embody in a procedure. This also provides the groundwork for flexible budgets covering all indirect expenses, both labor and supplies.

This article, based on the paper *"Basic Cost Concepts for the Small-Medium Foundry,"* will be presented at an Industrial Engineering-Cost session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

FRANK NEWBERRY / *General Foreman*
Finishing Dept., Oklahoma Steel Castings Co., Inc.
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CARBON ARC BLAST SMOOTHS ROUGH SURFACES

How one steel foundry reduced casting finishing costs

■ Carbon arc-compressed air pad washing has reduced grinding and cleaning costs in the finishing department of Oklahoma Steel Castings Co., Inc.

In our plant the castings are brought from the foundry to the cleaning room in tote boxes by five-ton crane. The loose sand and cores not removed by the shakeout, especially internal cores, are removed by an air hammer or by striking the castings manually with a hammer. The castings are then placed on a four-table automatic cycle blast for additional cleaning.

After blasting, the castings are placed on plates on conveyor lines for removal of gates and risers by oxyacetylene torch. After the gates and risers are removed, the castings pass into the burn-out booth for inspection and defect removal. They then move along the conveyor line into the weld booth. After welding the castings are ready for pad removal.

We use the carbon arc process with copper-clad carbon electrode for removal of gates, riser pads, fins, nails, and excess weld deposit. For this operation we use two 600-amp rectifier welding units tied together, and an electrode holder fitted with a ¾-in. head to take ⅝-in. copper-clad carbon electrodes. The welding machines are about ten feet from the booth. The welding cable passes through a compressed air hose and attaches to the holder.

We use 80 psi compressed air at the torch. Air is turned on before making contact with the metal to be removed so that the melted metal will be blown away. This allows the operator to better observe the contour of the casting. The operator then moves the electrode back and forth in a rhythmical fashion.

We cut our gates and risers on the average of about 3/16-in. high, which enables us to remove all the metal at one pass. It is seldom necessary to make a second pass to clean the casting. Since the air is on at the time the arc is struck, metal is blown away as rapidly as it is melted and there is no difficulty with carbon pick-up.

Here's what we use in the way of equipment, and some of the costs:

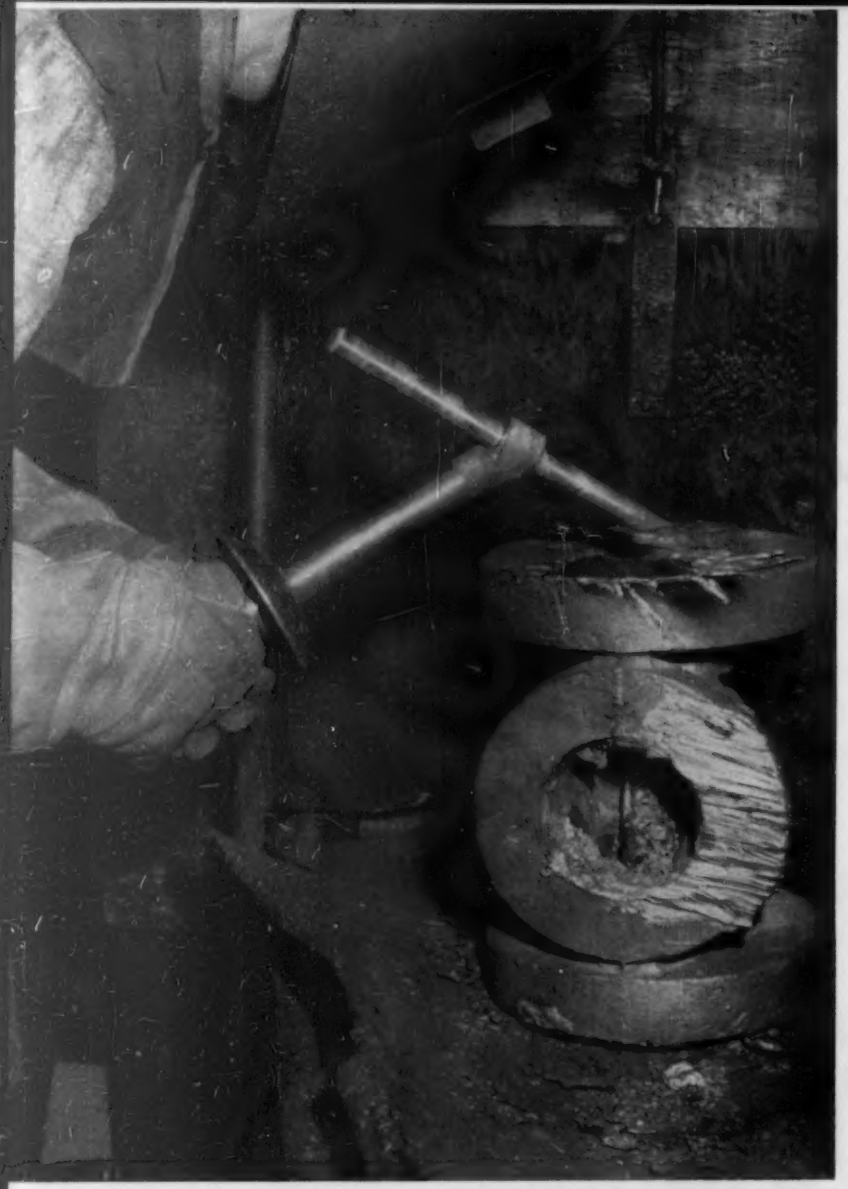
Copper-clad carbon electrode	⅝-in.
Rectifier welding machine	1200-amp
Electrode cost	$0.294 each
Amperage setting	750
Minutes contact time per electrode	7.25
Pounds metal removed per electrode	4.90
Electrode cost per pound metal removed	$0.06
Electrode cost per sq. in. pad area, avg. pad thickness 3/16-in.	$0.0032
Power cost per hour operation	$0.30
Contact time	About half the total working time

While the pounds of metal removed as shown on the standards data is 4.90 per electrode, it must be remembered that such things as pad washing, fin removal, and nails are included. On a large piece of metal we found that we could remove ten pounds of metal per electrode.

The electrodes are 12 in. long, and we use them down to approximately three inches. A fixture which we attach to the stub lets us use

4-table shot blast removes last of sand prior to torching gates and pads.

Castings on roll conveyor are gas torched to remove gates and risers.



Air blast combines with carbon arc to remove metal left by gas torch.

more of the electrode, thus reducing the cost. As a comparison of costs, the standards data show that 3.2 mills is the cost of electrodes per square inch of pad that has an average thickness of $\frac{3}{16}$-in. Our swing frame grinding cost is approximately 4 mills per square inch on the same thickness.

From the curves in our standards department, we find that the carbon arc process with $\frac{3}{8}$-in. copper-clad carbon electrode removes the metal approximately 20 per cent faster than swing frame grinding. This reflects the savings in labor and materials. The operator can do a better job holding the contour of the casting than with the swing frame grinder where he is working some distance from the metal.

We would like to use much higher current than 750 amps, since the speed of metal removal is much greater as the amperage is increased. But at present the holders available to us will not stand it.

We make many high pressure castings on which the customers do not allow welding, and we have had complaints from these customers because the area where the metal is removed by the carbon arc process appears to have been welded. However, we have had no difficulty in proving this was not the case.

We use carbon arc equipment immediately following weld repair, and in this way the operator can remove all pads, fins, and nails as well as excess weld deposits. Following this operation we use a hand grinder to slick up the area. Actually, the operator makes no attempt to remove metal with the hand grinding operation. Many of the castings are shipped to the customer without any hand grinding.

We have found it more economical to use copper-clad electrodes than plain carbon or copper-coated electrodes. Based on pounds of metal removed, we have found that the cost of copper clad electrode is 15 per cent less than either of the other types.

The copper clad electrode does not heat more than about one inch up from the work. The plain carbon and copper-coated electrode heated up to the holder, causing maintenance on the holder to be greatly increased. There is no breakage on the copper-clad electrode, while breakage on the other types was very high. Since the copper clad electrode lasts one-third longer, labor costs are reduced in time spent changing electrodes.

Some rectifier units are not suitable for continuous operations with carbon arc equipment. We have had much difficulty with some rectifier units; however, our oscilloscope observations show that those we are now using are well designed and capable of continuous operation. We are well pleased with the equipment and plan to install two more units in our cleaning lines.

This article, based on the paper *"Eliminate Grinding—Lower Cost of Cleaning Operations,"* will be presented at a Steel session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

Out of cleaning room, casting is smooth, took less time, money, to finish.

FACTS OF REFRACTORY LIFE

Your air furnace bottom will last longer if you select the right refractory

C. C. Lawson / *Gen. Supt.*
Wagner Malleable Iron Co.
Decatur, Ill.

Lyle R. Jenkins
Metallurgist

■ Refractory life in air furnace bottoms is greater the lower the impurity content of the brick according to a three-year study made by the authors. Service life of eight refractories with different physical and chemical properties was compared with manufacturers' laboratory tests.

The tests were run in two production air furnaces which are part of a cupola-air furnace duplexing system. The furnace bottoms are totally enclosed by a steel shell and the space between the service bottom and floor is filled with sand. The furnaces are old style with bottoms which are not air cooled. Inside dimensions are 7 ft wide by 29 ft long. They are fired with single pulverized coal burners. Cupola iron enters just inside the bridge wall. The tapping blocks are located on one side about 7 ft from the burner wall and 20 ft from where the cupola metal enters.

At the beginning of a refractory life improvement program in February 1953, thermocouples were placed beneath the service bottom in the hottest zone of the furnace. This was found, by experiment, to be in the center of the furnace just past the tapout blocks. The hot junction of the thermocouple was in contact with the heel of the service bottom brick.

The normal practice at this time was to fire each furnace for five consecutive days and then tear it down for repairs. This usually consisted of an entire bottom replacement to insure against failure and resultant production stoppage. Several super duty refractories were tested with no significant improvement. Different methods of laying, regardless how tight, showed no significant life improvement. The failures appeared to be due to joint penetration. The brick were still full size.

The thermocouple study indicated that at the end of the second day the temperature at the heel of the service bottom brick had increased to 1940 F. This was 46 hours after the furnace was first fired off. At the beginning of the 3rd day, the bottom had cooled to only 1860 F and at the end of the 3rd day the temperature had increased to 2080 F. At the beginning of the 4th day, the bottom had cooled to only 1920 F. and at the end of this day had increased to 2090 F. At the beginning of the 5th day, the heel of the service bottom had cooled to 1930 F and at the end of the day the temperature had increased to 2090 F again. The firing period is normally 22-23 hours per day.

It was then decided that the two furnaces should be fired on alternate days. This decreased the rate of temperature rise and shortened the time the heel of the brick was at high temperature. With the practice of alternate day firing, the furnace was operated for 16-22 days (354-470 firing hours) before the heel of the brick reached 1950 F. After an extended period of operation (30 days), the temperature occasionally reached 2300F without apparent danger. The actual time at this temperature was short. The average temperature peak during

COMPARISON OF AIR FURNACE BOTTOM LIFE WITH REFRACTORY PROPERTIES

Refractory	A	B	C	D	E	F	G	H
Melting Point	3335 F	3310 F	3335-3389 F	3308-3335 F	3173-3200 F	3335 F	3300 F	3172-3200 F
PCE	38	37	38-39	37-38	33-34	38	36-37	33-34
Density lb/cu ft	154	157	162-168	144-150	140-147	152-157	140-142	140-142
Permanent Reheat Change	0.1% exp	0.5% exp	0.0-2.5% exp	0.0-2.5% exp	0.5% cont 1.0% exp	0.2-2.5% exp	2.5-3.6% exp	0.5% exp 0.9% cont
Hot Load Strength Temperature	3200 F	3200 F	2640 F	2640 F	2640 F	2640 F	2640 F	2640 F
Deformation	0.45%	3.2%	0.5-2.0%	1-3%	3-5%	1.5-3%	2.5-2.3%	3-5%
Panel Spalling ASTM C122-47	0.0%	0.0%	1-3%	1.3%	0.4%	3-10%	1-3%	1.5-4%
Modulus of Rupture ASTM C133-39	1200 psi	2800 psi	1000-1300 psi	900-1200 psi	1000-1600 psi	1200-1600 psi	550-800 psi	600-1000 psi
Apparent Porosity ASTM C20-46	24%	15%	23-27%	23-27%	12-16%	20-24%	19-22%	12-16%
Water Absorption ASTM C20-46	9.8%		9-11%	11-13%	5- 7%			
Chemical Analysis								
Alumina	76.17	61.4	78.0-82.0	68.0-72.0	42.5-45.0	68.9	60.5	41.6
Silica	20.08	35.4	11.0-15.0	21.0-25.0	51.5-53.5	24.3	32.1	52.8
Titania	2.51	2.0	2.5- 3.5	2.5- 3.5	1.2- 2.2	2.9	2.9	2.3
Ferric Oxide	0.87	0.9	1.5- 2.5	1.5- 2.5	1.0- 2.0	1.9	1.8	1.5
Calcium Oxide	trace	trace	0.6- 1.3	0.6- 1.3	0.2- 0.8	0.2	0.4	0.3
Magnesium Oxide	trace	trace	0.0- 0.5	0.0- 0.5	0.0- 0.5	0.3	0.5	0.4
Alkalies	0.08	0.2	1.0- 2.0	1.0- 2.0	0.5- 1.0	1.5	1.8	1.2
Service Life								
Days	44	37	38	30	16	26	26	21 *
Tons	5607	7757	8381	4832	2071	4879	4900	2270
Hours Fired	953	851	874	690	361	598	530	315

* Single shift (15 firing hours)

this period was 2000 F. There were no more production stoppages in mid-day due to the bottom floating.

Caution! The thermocouple protection tube can become an uncontrollable tapping spout in case of bottom or sidewall failure in the vicinity of the tube. Provision should be made for plugging this hole in the side of the furnace.

The next step in the program was to experiment with heavier duty refractory brick. Those which indicated a reheat expansion were selected because it was felt that a bottom would tighten up rather than become loose and allow joint penetration to take place. This was quite evident in that as time passed, the shell of the air furnace was pushed out, and bent the vertical rail buck stays.

In a normal day of production, the furnace is fired off at about 11 pm the night before it is used. Iron from the cupola enters the furnace at about 4 am and the furnace is tapped first at 6:30 am. Cupola iron runs into the furnace continuously until about 9 pm. The furnace is intermittently tapped until it is empty at 11:15 pm.

There is a considerable period of time during which the bottom is exposed to a flame without the protection of an iron layer. The normal depth of iron at the center of the furnace near the tap holes is 7 inches. The flame temperature (optical pyrometer) from the burner is about 3160 F to 3200 F. The iron temperature at the spout is 2860 F to 2880 F.

The table lists several types of refractories with their comparative laboratory test properties and observed service life. The data for this table were furnished by the respective refractory manufacturer.

Refractory *A* spalled in areas of about 2 to 3 ft in diameter and in various locations at different times. About one inch of brick depth would break away clean and flat. The thickness of this bottom in the vicinity of the tap holes was reduced to about 2 in. prior to removal and replacement. The joints were still tight and there was no evidence of iron under the bottom. This brick showed a more rapid increase in temperature at the heel which indicated greater thermal conductivity. When used in the sidewalls, the brick spalled excessively.

Refractory *B*, which shows a 61 per cent alumina content, proved to have comparable life to refractory *C* which has an 80 per cent alumina content. Refractory *B* showed superior resistance above all others to erosion when used for lining the cupola front slagger. The reason may be that refractory *B* contains less impurities than the other refractories.

Refractory *D* showed fairly good bottom life. This refractory had superior resistance to flame erosion in the air furnace sidewalls.

Refractories *E* and *H* proved to be inferior to the higher alumina materials. They are kept in stock for rapid, short time, bottom repairs where the expected remaining service life is within that of the patching material.

Refractory *F* showed considerable spalling in various locations and was removed at about the same time for each bottom life.

Refractory *G* appeared to give satisfactory service; however, each time a bottom was removed there was iron under it. This led to the opinion that the operation was being carried out near the danger point.

It is interesting to note that refractories *A*, *B*, *C*, and *F*, were not patched, and when removed, showed indications that they still had additional life left. The service lifes listed in the table do not include any additional service after patching.

■ **Conclusions.** It seems possible that the laboratory tests may be used to predict the action of a refractory in service. The impurity content of the refractory appears to have a strong effect on its general properties.

■ In laying up a bottom, care should be exercised to see that the heels of the bricks in each ring are as tight as the tops. The best brick available will fail prematurely if it is improperly set. Each brick is dipped to cover all contacting surfaces with an even layer of a sillimanite mortar cream. The completed new bottom is given a thin sillimanite mortar wash to fill any existing joint cracks. Sand is never swept over the bottom.

■ Standard 9-in. brick are preferred because they are more easily obtained, and they form a smoother contour for the bottom. The few extra joints as compared to the large brick, do not seem to affect the service life of the bottom.

■ High alumina refractories appear to give longer, more dependable, service life than those of lower alumina content.

■ Impurities, such as iron oxide and alkalies, may tend to shorten the expected life of a given alumina content. This is especially noticeable in the linings of cupola front slaggers. In service, 60 per cent alumina brick of high purity, had as good bottom performance as 80 per cent alumina brick of lower purity.

■ The present practice is to use either the 60 per cent alumina brick of high purity, or the 80 per cent alumina brick of lower purity, because it is felt that they are more dependable than the other brick listed in the table.

This article, based on the paper "*A Study of Air Furnace Bottom Service as Related to the Chemical and Physical Properties of Various Refractories*," will be presented at a Refractories session of the 1956 AFS Castings Congress & Show in Atlantic City, May 3-9.

Vacuum Chisels and Grinders Cut Cleaning Room Dust

■ British researchers have developed hollow chisels and grinding wheel hoods that connect to vacuum systems to remove dust at the source.

The hollow chisel was operated on an exhaust volume of 4 cfm supplied by an eductor operating at a vacuum of 12 to 15 in. mercury. The exhaust hose was connected to the hollow chisels through an annular piston in the pneumatic hammer.

Dust samples were collected with the Owens jet sampler, the konimeter, and the thermal pre-

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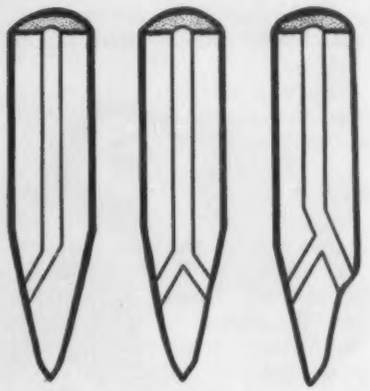
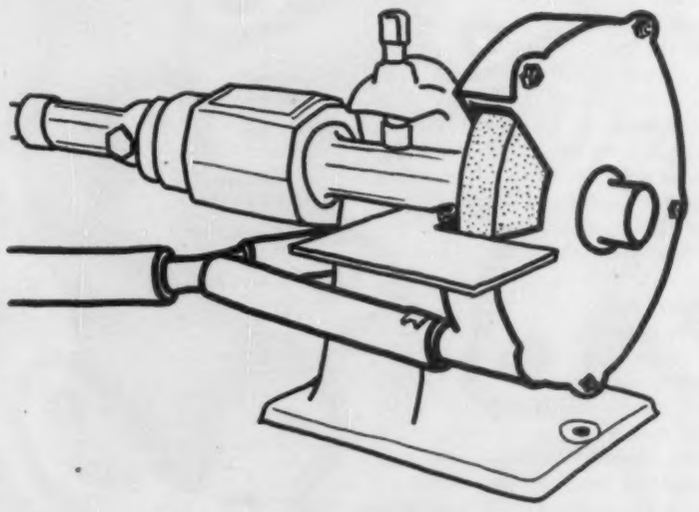


Duct and inlet ports in chisels.



Pneumatic hand grinder set up for bench work. Vacuum at lower left.

Better Sand Practice Leads to Fewer Defects

The following bibliography has been prepared by the AFS Technical Department as a guide to better sand practice with particular emphasis on elimination of defective castings. Latest articles of about the past 12 months, still fresh in the minds of followers of castings industry literature, have not been included.

American Foundryman (now MODERN CASTINGS)

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"Identify Casting Defects," Vadeboncoeur, J. O., vol. 13, Jan., 1948, pp. 56-59.

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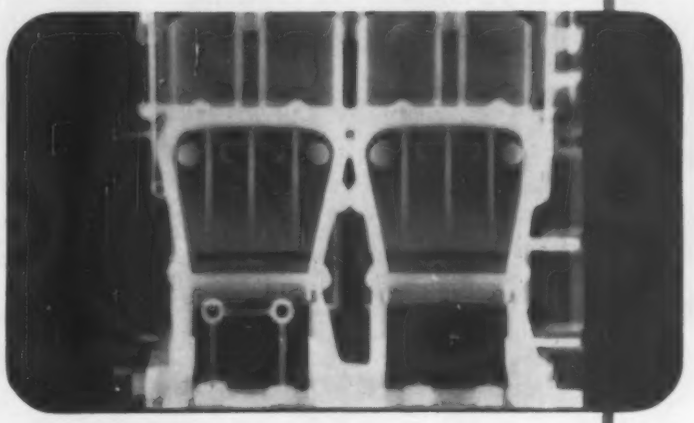
"Foundry Sand Control–No. 1 Enemy of Scrap," Anselman,

continued on page 126

Dependability is a must . . . so



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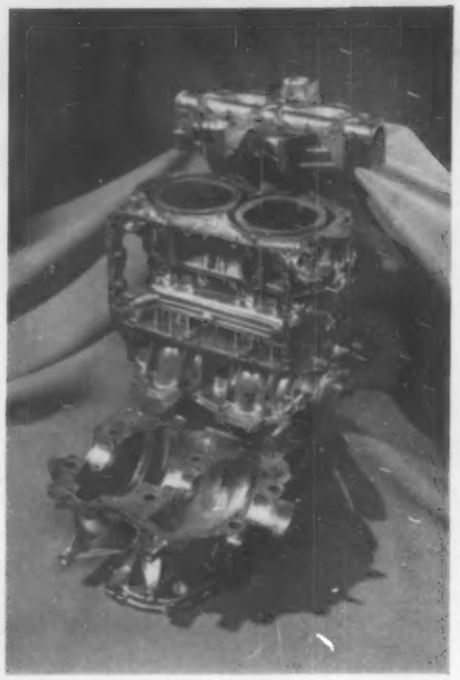

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CIRCLE NO. 222, PAGE 13-14

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continued from page 125

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"Fool-proof Sand Works for Wide Range of Castings," Schumacher, J. S., vol. 21, June, 1952, pp. 54-57.

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continued on page 127

continued from page 126

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Foundry

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continued on page 128

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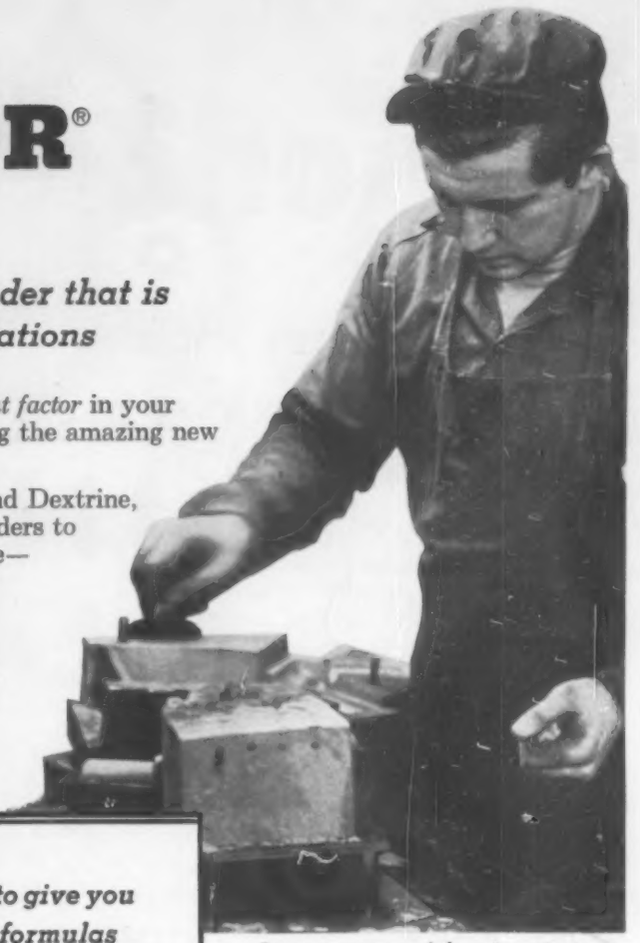

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Dry sand	Kordek plus DEXOCOR
Flowability	Dextrine or Kordek
Moisture resistance	DEXOCOR
Collapsibility	DEXOCOR plus Dextrine • Kordek or Mogul
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CIRCLE NO. 223, PAGE 13-14

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Atlantic City Site of ASTM Annual Meeting

■ Over 500 meetings devoted to discussions of numerous subjects relating to the researching and testing of engineering materials will be held during the 59th annual meeting of the American Society for Testing Materials to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 17-22.

ASTM is a technical society of over 10,000 members and committee members grouped into over 1500 technical committees. The metal castings industry is represented by many individual and company members and by the American Foundrymen's Society which was one of the founding members of the organization.

A total of 31 sessions are now scheduled for the June meeting. Eight symposiums scheduled including the following subjects: Specific Gravity of Bituminous Coated Aggregates, Ion-Exchange and Chromatography in Analytical Chemistry, Solder, pH Measurement, and Tension Testing of Non-Metallic Materials. In addition, sessions are scheduled at which individual papers will be given on the subjects of metals, fatigue, stainless steel, and general testing.

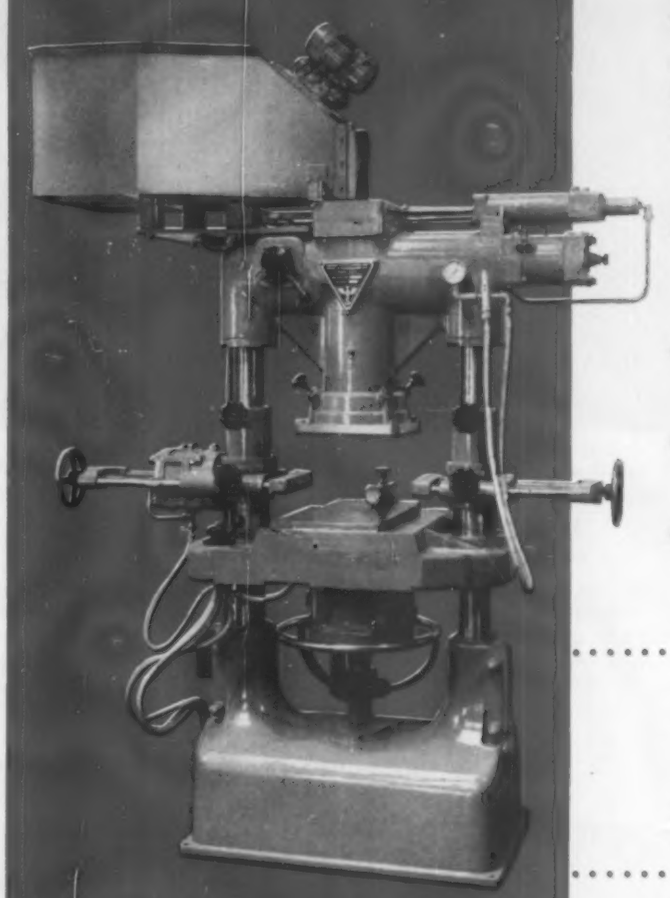
Important on the program are two lectures, the Edgar Marburg Lecture and the Gillett Memorial Lecture. The Marburg Lecture this year will be given by Dr. Charles E. Reed, general manager, Silicone Products Dept., General Electric Co., Waterford, N. Y. on "The Chemical Properties and Applications of Silicones." Dr. D. K. Crampton, director of development, Chase Brass and Copper Co., Waterbury, Conn., will give the Gillett lecture on "Structural Chemistry and Metallurgy of Copper."

An exhibit of testing and scientific apparatus and laboratory supplies will be held in conjunction with the technical program. Items to be displayed will range from small hand-manipulated instruments through electronic control devices and high temperature ovens to universal testing machines.

Wednesday evening, June 20, the Philadelphia District Counsel will be host at the annual dinner.

CIRCLE NO. 225, PAGE 13-14

V+S Core Shooter



The V + S Core Shooter is available in 4 sizes of varying capacities. Shoot Heads can be furnished to accommodate all core boxes.

...for fast, economical production of cores

- The V + S Core Shooter is as revolutionary as the first core blower. It offers an entirely new core making technique.
- Extremely high green strength "stand up" cores can be made with any binder —oil, resin, or STEINEX*. This amazing machine will even shoot molding sand.
- Wooden core boxes can be used as successfully as metal boxes. Very little air used.
- Economical for mass production and short runs as well. Core boxes can be changed readily.
- Extremely simple—no motors, relays, wires, no bearings, shafts or plows to contend with—assuring fewer shutdowns and less maintenance cost.

Try This Kleenex Tissue Test

Place half a KLEENEX tissue in the core box and shoot it in the V + S Core Shooter. The Kleenex will not be damaged. A regular core blower will tear it to bits.

Ideal for CO_2 Process with STEINEX because hardening in shoot holes and shoot heads is eliminated.

***STEINEX** is a remarkable core sand binder. Cores and shell molds, made of core sand mixed with STEINEX can be hardened in a few seconds by the injection of carbon dioxide — and used immediately

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FEF Engineering Solves Foundry Problems

At the speakers' table during the FEF annual banquet were, left to right: M. J. Allen, E. C. Hoenicke, J. H. Smith, D. W. Malott, T. Kaveny Jr., H. E. Helling Jr., C. V. Nass, E. M. Knapp, and E. J. Walsh. The speaker was Dr. Malott.

■ Foundry problems solved through engineering was the theme of the Ninth Annual College-Industry Conference of the Foundry Educational Foundation held March 7 and 8 in Cleveland.

The importance of the Foundry Educational Foundation to engineering in the metal castings industry was emphasised by James H. Smith, Central Foundry Division, who was elected to the presidency of the foundation's board of trustees. Smith stated that, "Foundation-inspired improvements in facilities, teaching staffs, and courses, have stimulated a greater interest in the foundry industry, and the students who have participated in the program are making an important contribution to the progress of the industry."

A high-light of the conference was the annual banquet which presented Dr. Deane W. Malott, president of Cornell University as the featured speaker. Dr. Malott discussed "The New Links between Education and Industry."

The program for the conference was planned under the direction of E. C. Hoenicke, president of the foundation's board of trustees; J. H. Smith, vice-president; E. M. Knapp, secretary-treasurer; and E. J. Walsh, executive director.

The new officers of the foundation are Smith and C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., who was elected vice-president. E. M. Knapp, secretary-treasurer, and E. M. Walsh, executive director, were re-elected. New trustees are: C. E. Brust, E. L. Roth, O. J. Meyers, W. B. Wallis, Edward Metzger, M. J. Allen, F. G. Steinebach, C. W. McLennan, C. C. Chambers, H. C. Erskine, and W. W. Heimberger.

Further evidence of the value of engineering was disclosed during a panel discussion on the subject "Application of Engineering in Foundries," which was led by R. L. Gilmore, Superior Steel & Malleable Castings Co. During this discussion of the practical and profitable applications of engineering knowledge to the solution of every-day foundry problems emphasis was placed on actual experiences common to all foundries.

Foundry Educational Foundation scholarship programs are now in effect at the following schools: Alabama, California, Case Institute, Cincinnati, Cornell, Illinois Institute of Technology, Kentucky, M.I.T., Michigan, Michigan State, Missouri School of Mines, Ohio State, Penn State, Purdue and Wisconsin.

J. H. Smith

C. V. Nass

E. C. Hoenicke

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Minnesota—Smith-Sharpe Co.
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Missouri—Barada & Page, Inc.
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New York—Combined Supply & Equipment Co.
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New York—G. W. Bryant Core Sands, Inc.
McConnellsville

Ohio—Stoller Chemical Co.
Arkon 20

Oregon—La Grand Industrial Supply Co.
Portland 1

Pennsylvania—Pennsylvania Foundry Supply & Sand Co.
Philadelphia 24

Tennessee—Robbins & Bohr
Chattanooga

Washington—Carl F. Miller & Co., Inc.
Seattle 4

Washington—Pearson & Smith Distributing Div., Spokane Pres-To-Log Co.
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Fe_2O_3	3.67%
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Na_2O	2.76%
K_2O	.60%
Bound Water	5.50%
Moisture @ 220°F	8.00%

High-grade NATIONAL BENTONITE characteristics

Specific gravity of dried material	2.79
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Fusion temperature	1340°C—2444°F
Weight of dried bulk unpulverized	71 lb. per cu ft.
Weight of pulverized material	61 lb. per cu. ft.
Weight of crude, crushed, undried material	80 lb. per cu. ft.
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CIRCLE NO. 226, PAGE 13-14

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CIRCLE NO. 227, PAGE 13-14

foundry trade news

Foundry trade news is overshadowed by increasing prices of pig iron and aluminum. The $1.50 per ton increase in pig iron prices and the 1½¢ a pound increase in basic aluminum pig prices may start a round of general increases in castings prices.

Lectromelt Furnace Co. . . . former Pittsburgh Lectromelt Furnace Corp., Pittsburgh, became a division of McGraw Electric Co., Elgin, Ill., January 30. W. B. Wallis continues as president of Lectromelt.

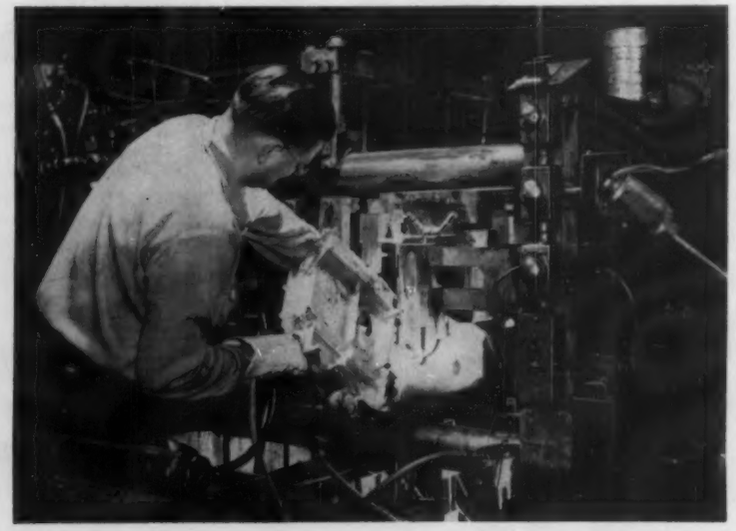
Airloy, Inc. . . . new firm started production of specialty steel and high alloy castings at Ennis, Texas, in March. W. A. Sebastian is president-treasurer, G. J. Grott is vice-president and general manager, and G. P. Hines is secretary.

National Malleable and Steel Castings Co. . . . has announced its second recent important expansion in Latin America with the signing of a new licensing agreement with Fabrica de Aco Paulista, S. A., Sao Paulo. New pact includes more products and direct investment in Brazilian firm by National Malleable. The Brazilian firm is owned by AGS, a Swedish industrial complex. National Malleable recently reported total sales of about $59 million for 1955, a 57 per cent increase over 1954.

Texon Pipe and Foundry . . brand new gray iron shop in Temple, Texas, poured its first iron on March 17. Firm plans to employ 165 people in production of soil pipe and fittings.

C. O. Bartlett & Snow Co. . . . Cleveland firm announces purchase of Grindle Corp., Harvey, Ill., which will now operate as a division of Bartlett & Snow's foundry equipment department. Present management of Grindle will continue production of handling equipment, cupolas, furnaces and equipment for control of in-plant environment.

Southern Mill and Foundry Supply Co. . . a new firm with headquarters at Gastonia, N. C., has been formed



Doehler-Jarvis will increase yearly capacity by 20 million lb of aluminum and 15 million lb of zinc die castings like the x-ray machine base shown.

Link-Belt: Ewart plant will get new foundry "A" and present foundry will make room from "B", new manufacturing facility to be built by 1958.

to sell and service shell molding equipment produced by Shallway Corp. New firm will operate throughout the South.

Gunite Foundries Corp: . . Rockford, Ill., plant has announced a million dollar expansion of their facilities for production of cast-steel wheels, brake drums and wheel assemblies for truck, trailer and bus market.

Aluminum Industries, Inc. . . control of Cincinnati firm has been sold to a group of Cincinnatians headed by T. E. Wood, J. R. Williams and H. O. Ash. Products of company include aluminum permanent and sand castings.

Allis-Chalmers Mfg. Co. . . has announced that the material handling equipment products of its Buda Div. will now be supplied to dealers through 12 factory branches and a Chicago district office.

Basic Refractories, Inc. . . is now officially known as Basic, Incorporated. Stockholders of Cleveland firm recently approved name change. The company has also announced that its 1955 income set a company record when it passed the $20 million mark.

International Nickel Co. . . has moved the office of the St. Louis technical field section of their development and research division to 10 S. Brentwood Blvd.

Hewitt-Robins, Inc. . . has announced record sales of over $47 million for 1955. Company purchased W. A. Jones Foundry and Machine Co., Chicago, on August 31 and now operates it as Jones Machinery Div.

Electro Metallurgical Co. . . has established a product and process development department to develop new products and to improve existing products.

Westover Corp. . . Milwaukee partnership formerly known as Westover Engineers was incorporated on March 1. C. E. Westover continues as president, treasurer and head of consulting division. J. A. Westover is vice-president, foundry division, while Oscar Kraft is vice-president, equipment division. Company secretary is C. Bogart. Firm is now doubling its engineering and manufacturing space.

Columbia Foundry Co. . . Los Angeles firm has joined Non-Ferrous Founders Society.

William F. Jobbins, Inc. . . Aurora, Ill., aluminum smelter has been sold to its management by Acme Aluminum Alloys. Management of 72-year old

University of Alabama was presented a centrifugal casting machine by U. S. Pipe and Foundry Co. Present to view present were: A. J. Fruchtl, James B. Clow & Sons; K. R. Daniels, American Cast Iron Pipe; E. C. Wright, Univ. of Ala.; Charles Drake and W. J. Estes, U. S. Pipe and Foundry; and G. A. Gorham, Alabama AFS Student Chapter.

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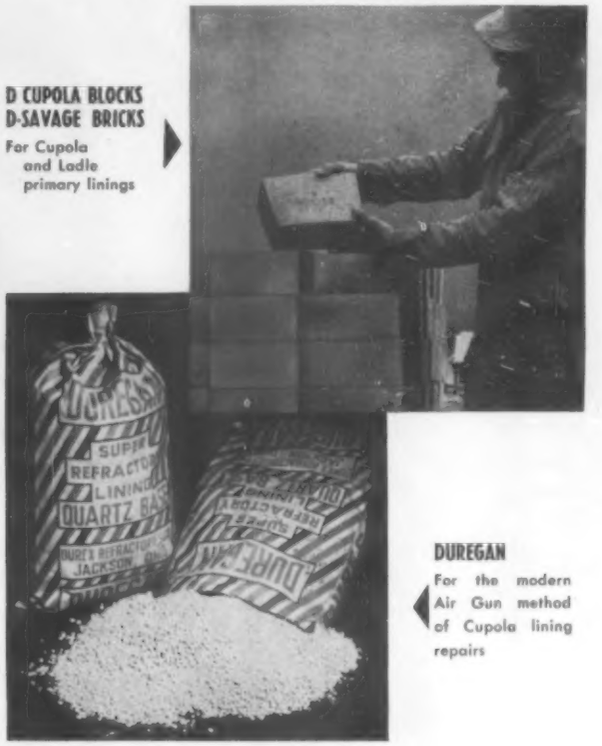

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CIRCLE NO. 228, PAGE 13-14

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Size for size, Ohio Magnets lift larger loads over longer periods because they *operate cooler*. So for extra magnet lifting power, extra magnet value—always specify Ohio Magnets and Ohio Magnet Controllers. There's a type and size for every lifting job. Send for free copy of Bulletin 112, or consult the Yellow Pages for Ohio offices in principal cities.

AA-1477

THE OHIO ELECTRIC MFG. CO.
5400 DUNHAM ROAD • MAPLE HEIGHTS • CLEVELAND, OHIO

ohio ELECTRIC
CHESTER BLAND
President

Ohio Also Makes Separation Magnets • Nail Making Machines • Fractional Horsepower, Shell and Torque Motors

CIRCLE NO. 229, PAGE 13-14

firm consists of: C. V. Cooper, president; R. K. Arundale, vice-president; and J. J. Stumm, secretary-treasurer.

Interlake Iron Corp. . . largest producer of merchant pig iron has stated that its net of over $8 million in 1955 set a new company record.

Lindberg Industrial Corp . . Chicago company has purchased assets of Jet Combustion Co., Chicago furnace builder, and will merge the operation with its own.

Foote Mineral Co. . . has announced that the exchange of 169,178 of its shares for the assets of Electro Manganese Corp. is complete.

Selas Corp. of America . . manufacturer of heat treat equipment and continuous melting furnaces for aluminum is now operating its new plant at Dresher, Pa.

Mayfield Sanitary Pottery Inc. . . Perrysville, Ohio, firm has joined Non-Ferrous Founders Society.

General Refractories Co. . . manufacturer of fire brick and refractory specialties has announced plans for a new plant to be built at Smithville, Ont., by its subsidiary, General Refractories Co. of Canada, Ltd.

Abrasive Machine Methods Corp. . . Cleveland firm has been named exclusive representatives in northeastern Ohio for Buckeye Tools Corp.

Kaiser Aluminum & Chemical Corp. . . will expand the primary aluminum capacity of its Chalmette, La., reduction plant by 55 million pounds annually.

Official 1955 production figures for the steel industry in Western Germany show that the country now leads Europe in iron and steel production and is ranked by only the U. S. and Russia.

Aluminum Limited . . Canadian aluminum producer reported a record year in 1955, reaching new levels in production, sales and profits. Net income was over $48 million.

Allegheny Ludlum Steel Corp. . . has just completed a year's modernization program at its Buffalo plant which improves competitive position of the operation.

Symington-Gould Corp. . . is now experimenting with titanium castings at its Depew, N. Y. plant.

Precision Testing Laboratories, Inc. . . Andrew R. Spencer has organized

firm at 15329 Schoolcraft, Detroit 27, to offer services as consulting metallurgist and chemist with general metallurgical and chemical laboratory facility.

Burke's Aluminum Foundry . . Los Angeles, Calif., firm has joined Non-Ferrous Founders Society.

Blaw-Knox Co. . . has reported 1955 net sales as $109 million with a year-ending backlog of $64 million.

Woodward Iron Co. . . **Woodward,** Ala., firm has published a bulletin that presents a panoramic view of the Woodward operating facility.

Slack-Horner Brass Mfg. Co. . . has moved to Longmont, Colorado, from Denver. Officers of fifty-year old firm are **John W. Horner, Sr.,** president, John W. Horner, Jr., vice-president, and **William H. Franz, Jr.,** secretary-treasurer.

Great Lakes Mfg. & Foundry Co. . . Wyandotte, Mich., plant has set safety record by operating 26 per cent below the industry's accident average for the last six years.

Arwood Precision Casting Corp. . . Brooklyn, N. Y., plant announces release of a booklet describing application of investment castings.

Link-Belt Co. . . 1955 sales of over $129 million were second highest in firm's 80-year history.

Camsco Foundry, Inc. . . Azusa, Calif., plant has joined Non-Ferrous Founders Society.

Yale & Towne Mfg. Co. . . has recently completed a $5 million, 3 year research program resulting in development of new lines of fork trucks.

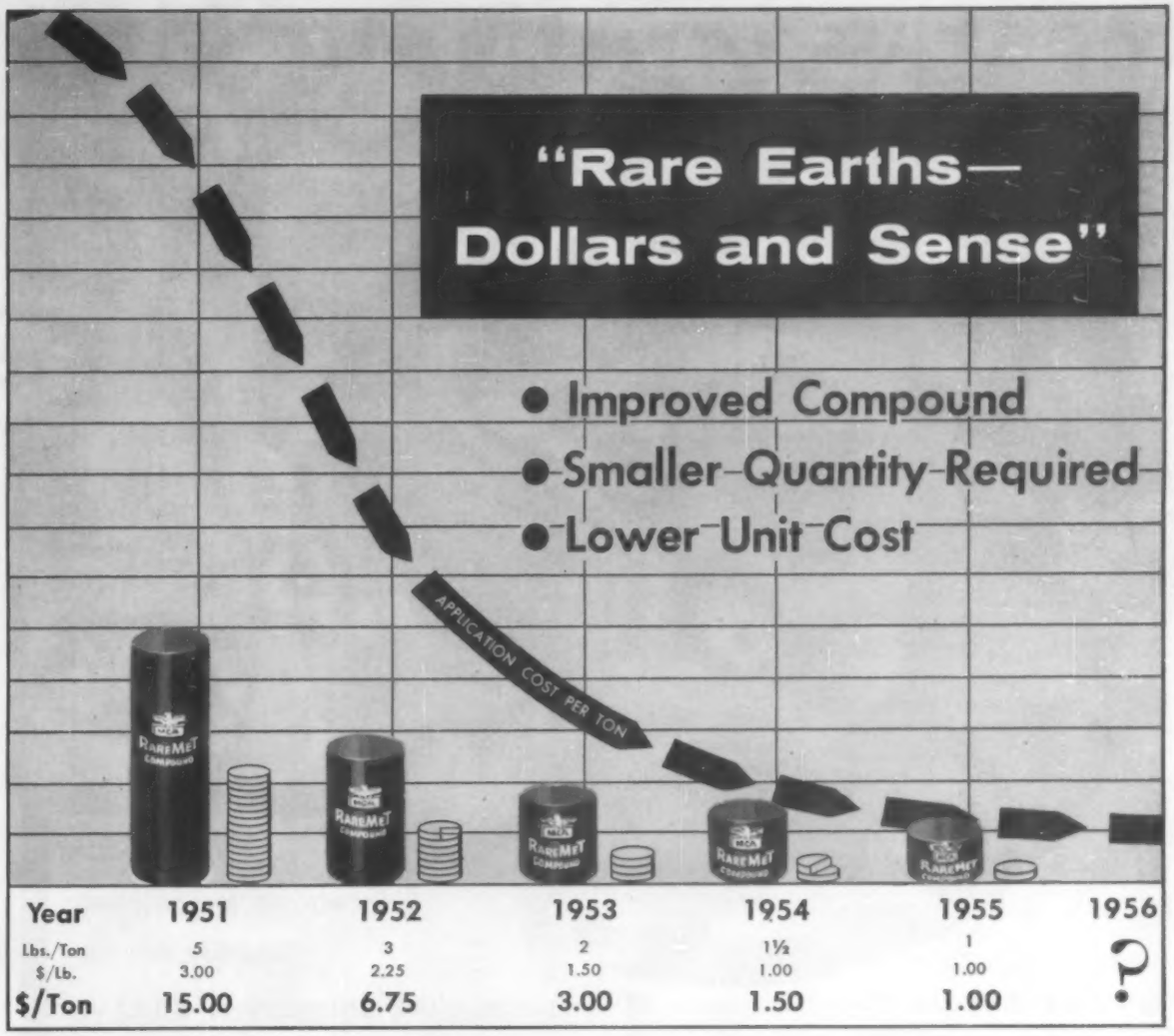
Dracco Corp. . . has appointed Horrell Co., Los Angeles, as Southern California distributor for their conveyors and dust collection systems.

Ohio Precision Castings, Inc. . . Dayton, Ohio, firm has joined Non-Ferrous Founders Society.

International Nickel Co. of Canada, Ltd. . . reports net earnings of over $91,000,000 for 1955.

Elwell-Parker Electric Co. . . Cleveland firm is celebrating its 50th anniversary of industrial truck production.

Urick Foundry Co. . . has been issued the trademark "Urite" to identify a



Year	1951	1952	1953	1954	1955	1956
Lbs./Ton	5	3	2	1½	1	?
$/Lb.	3.00	2.25	1.50	1.00	1.00	
$/Ton	15.00	6.75	3.00	1.50	1.00	

So rapid has been the advance in technical progress and use of rare earths (Trade Name: MCA RareMeT Compound) that in the brief span of four years, about one-fourth as much is needed to accomplish the desired results, at one-third the cost per pound. Now, the economics in favor of rare earths are ten times as great as they were four years ago.

In OPEN HEARTH STEELS, the improvement in addition practice is making rare earths more and more economical, actually cutting production costs. Excellent results with STAINLESS STEEL in hot workability and increased yield have been verified consistently.

Most steel producers, conscious of their customers' increasing demands for better quality, greater uniformity, and consistently good iron and steel are actively engaged in research employing rare earths. If the cost of iron and steel producing is at all interesting to you, or if customer rejections play any part in your operations, it will pay you to investigate the intelligent use of MCA RareMeT Compound. A letter addressed to any office will bring prompt and confidential response.

MCA

MOLYBDENUM CORPORATION OF AMERICA

Grant Building Pittsburgh 19, Pa.

Offices: Pittsburgh, Chicago, Detroit, Los Angeles, New York, San Francisco
Sales Representatives: Edgar L. Fink, Detroit; Brumley-Donaldson Co., Los Angeles, San Francisco
Subsidiary: Cleveland-Tungsten, Inc., Cleveland Plants: Washington, Pa., York, Pa.

CIRCLE NO. 230, PAGE 13-14

Meet us in Atlantic City!

SIXTEEN-STRONG... Your Shalco Field Service Engineers

Make a note of the Shalco Field Service Engineer from your area, and ask him at the Show for names of Shalco-equipped foundries in your vicinity.

VISIT SHALCO BOOTHS 238, 240, 339, AND 341, AND SEE

TOMORROW'S EQUIPMENT TODAY!

Shalco will also be on display at the International Metallurgical Fair, Leige, Belgium, April 28 - May 15, and at the International Foundry Trades Show, Duesseldorf, Germany, September 1-9.

FOR A CLOSER LOOK—

and an opportunity to operate Shalco equipment yourself, and to examine sample shell cores and shell molds from foundries all over the country, may we suggest you stop off at the SHALCO DEMONSTRATION CENTER, near the Pennsylvania Turnpike in Connellsville, Pa., on your way home from Atlantic City or anytime.

SHALCO

World Leaders in SHELL MOLDING MACHINES • SHELL CORE BLOWERS

SHALCO ENGINEERING CORP.
Palo Alto, California

SHALLWAY CORPORATION
Connellsville, Pa.

CIRCLE NO. 231, PAGE 13-14

series of cast irons, in tensile strengths up to 60,000 psi, now being produced at their Erie, Pa., plant.

Crobalt, Inc. . . Ann Arbor, Mich., firm has published a bulletin describing their production of shell-molded castings.

Aluminum Co. of America . . has announced sales and earnings for 1955 reached record levels. Net income was over $87 million.

Accurate Die Casting Co. . . Cleveland firm has published 40-page brochure describing services and facilities they offer.

Electro Refractories & Abrasives Corp. . . set a company sales record in 1955 by increasing sales to over $5,500,000.

Premier Co. . . St. Paul, Minn., manufacturer of vacuum cleaning and maintenance equipment now has newly expanded plant in operation.

Steel Founders' Society of America . . has published No. 73 in their series of product design studies.

Wolverine Short Courses

Two courses of interest to foundrymen will be offered at the University of Michigan this summer as part of a program of intensive courses for practicing engineers.

A course in investment castings will be offered September 10-15 under R. A. Flinn and J. W. Freeman. Small particle technology and its application to air pollution will be taught June 25-29 by J. L. York and Seymour Calvert.

Housing for students attending either course will be arranged at the Michigan Union.

Complete information regarding the courses may be obtained from Professor Donald L. Katz, University of Michigan, 2028 East Engineering Building, Ann Arbor, Mich.

Now Where Was That?

■ You will have no trouble locating articles in back issues if you write for the index to 1955 issues of MODERN CASTINGS.

Vacuum Chisels

continued from page 124

cipitator. Sample time varied from two to seven minutes. The thermal precipitator samples showed an average dust concentration of 13.0 million particles per cubic foot of air with the exhaust turned on and an average concentration of 46.5 million with the exhaust turned off.

The samples were taken under laboratory conditions, not plant operating conditions, but the method of control seems to have merit.

A similar vacuum system was applied to the hood of a portable 6-in. grinding wheel using 23.5 cfm. The air velocity in the hose connection was calculated to be 11,500 fpm at 6 in. mercury.

The thermal precipitator samples showed a dust concentration of 8.5 million with the exhaust on and a concentration of 115 million with the exhaust off. This idea is not necessarily new (see Fig. 10 p. 72, AFS ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES.) Experience in this country has indicated that exhaust applied to portable grinding wheel hoods is ineffective except when grinding on flat surfaces. The British work was with flat castings.

The experimenters also applied their exhaust system to a standard pedestal grinder hood and attempted to use the fan effect of the wheel for dust control by drilling exhaust ports in the peripheral duct. A 6-in. wheel revolving at 6000 rpm was used. The exhaust volume was 46 cfm at 3 in. mercury. The fan action of the wheel alone without applied vacuum caused a velocity in the ventilation duct of 1000 to 1900 fpm.

Dust estimations in this case were made with the Owens jet counter. Dust concentrations with the exhaust on averaged 23.6 million particles per cubic foot of air and with the exhaust off, 254 million. This shows an excellent reduction in dust concentration.

A general atmosphere sample taken before the start of the test also showed a dust count of 23.6 million particles per cubic foot of

continued on page 139

Crucible Melting

10 SURE GAINS with CRUCIBLE MELTING

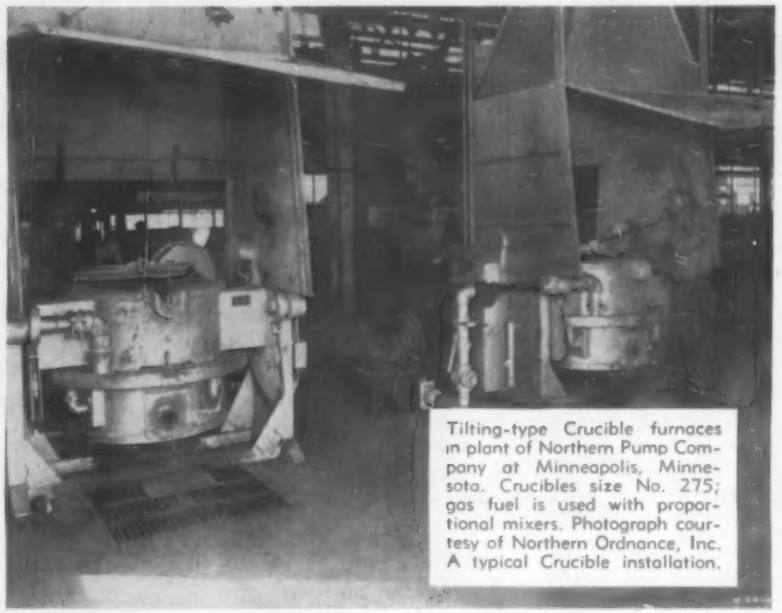
Get these 10 for your foundry

1. LOWER INVESTMENT
2. GREATER FLEXIBILITY
3. IMPROVED METAL QUALITY
4. LOWER METAL LOSSES
5. LOWER FUEL COSTS
6. LOWER DEPRECIATION CHARGES
7. MORE METAL PER HOUR
8. ADAPTABILITY
9. LOWER OVER-ALL MELTING COSTS
10. AND NOW YOU CAN GET LONGER CRUCIBLE LIFE THAN EVER BEFORE

*Each gain proved in actual experience; each enough in itself to make it pay you to use Crucible Melting.

For example, take No. 8—Adaptability. Crucible Melting best meets variations in size and analyses of melts required and expansion or contraction in production.

The 32-page, completely revised edition of Crucible Melting Handbook will be published soon. Watch for publication date.



Tilting-type Crucible furnaces in plant of Northern Pump Company at Minneapolis, Minnesota. Crucibles size No. 275; gas fuel is used with proportional mixers. Photograph courtesy of Northern Ordnance, Inc. A typical Crucible installation.

Stationary Crucible furnaces in the melting room of Fischer Casting Company, makers of bronze and aluminum castings, North Plainfield, N. J.

CRUCIBLES FOR ADAPTABILITY

Crucible STEEL MANUFACTURERS' ASSOCIATION
Room 1936, 11 W. 42nd Street
New York 36, New York

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING

ELECTRO REFRACTORIES & ABRASIVES CORP.
ROSS-TACONY CRUCIBLE CO.
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JOSEPH DIXON CRUCIBLE CO.
LAVA CRUCIBLE-REFRACTORIES CO.
AMERICAN REFRACTORIES & CRUCIBLE CORP.

CIRCLE NO. 232, PAGE 13-14

G. W. Myers
Vice-President

H. F. Park, Jr.
President

M. G. Moore, Jr.
Director, Div. I

SFSA Names New Officers & Directors

■ Steel Founders' Society of America named a new president, vice-president, and four new directors at its 54th annual meeting in Chicago March 19-20. Other major news items were in a technical vein with incorporation of the Steel Foundry Research Foundation announced during the meeting and the presentation of the first Gustaf A. Lillieqvist award for a technical paper.

The new president of SFSA is Howard F. Park Jr., General Steel Castings Corp., Granite City, Ill. Second in command will be the new vice-president, George W. Myers, Crucible Steel Casting Co., Milwaukee.

Newly elected to the board of the society are M. G. Moore, Jr., Empire Steel Castings Inc., Reading, Pa.; J. M. Kincaid, Jr., Kincaid-Osburn Electric Steel Co. Inc., San Antonio, Tex.; R. A. Thompson, Electric Steel Castings Co., Indianapolis, Ind.; and W. H. Muchnic, Locomotive Finished Material Co., Atchison, Kans.

F. Kermit Donaldson, executive vice-president; George K. Dreher, secretary; and Charles W. Briggs, technical and research director, were all re-elected.

Basic research relating to steel and metal alloy castings and studies in safety, hygiene, personnel and economics are to be sponsored by the new Steel Foundry Research Foundation. The articles of incorporation for the new foundation also permit it to support educational activities through the establishment of fellowships and professorships. Officers of the foundation are identical to the officers of SFSA and the first funds for the foundation came in the form of a $55,500 grant from SFSA.

First projects for the foundation are a study of welding of steel castings and a study that will attempt to correlate destructive testing of steel castings with stress analysis and mechanical properties.

Chairmen for the nine standing committees of the society were also named during the annual meeting. Committee chairmen for 1956 are: Advertising, Public Relations and Education, W. H. Worrilow, Jr., Lebanon Steel Foundry; Budget, Howard F. Park, Jr.; Market Research, A. M. Slichter, Pelton Steel Casting Co.; Product and Market Development, R. A. Gezelius, General Steel Castings Corp.; Safety, E. C. Huebner, Wehr Steel Co.; Specifications, R. H. Frank, Bonney-Floyd Co.; Statistical Reports, H. L. Holtz; Technical and Operating, I. M. Emery, Massillon Steel Casting Co.; Technical Research, H. D. Phillips, Adirondack Foundries and Steel.

Robert C. Wood, Minneapolis Electric Steel Castings Co., accepted the Technical and Operating Gold Medal from A. J. McDonald, retiring SFSA prexy.

Earle M. Layman received a SFSA Certificate of Merit for his service as chairman of the Steel Founders' safety program during the past three years.

Glenn R. Hughes, Ohio Steel Foundry Co., won Certificate of Merit for service as Chief, Castings Branch, Business and Defense Services Administration.

Frank X. Hohn, Scullin Steel Co., takes the award check for his technical paper which won the first Gustaf A. Lillieqvist Steel Foundry Facts Award.

F. K. Donaldson

G. K. Dreher

C. W. Briggs

Vacuum Chisels

continued from page 137

air and the British engineers point out in their reports that there was no difference in dust concentration at the breathing level whether the operator was grinding or not. The inference is that the exhaust system removed 100 per cent of the grinding dust.

Because of the testing technique used—principally the short sampling period—the 100 per cent efficiency of the system may be subject to question. The pressure used on the work, the condition of the piece of steel used in the test . . . whether it was clean or not . . . the rate of metal removed and the abrasive number of the wheel were not reported.

Further work with this type of exhaust application should be valuable, particularly in grinding on high lead alloys such as used in manufacture of journal bearings.

■ This review was made by Herbert J. Weber, director of Safety, Hygiene and Air Pollution Control, American Foundrymen's Society. The original study was reported to the Institute of British Foundrymen by W. B. Lawrie, A. T. Holman and E. B. James and was published in the *Foundry Trade Journal*, November 24, 1955.

Deep Freeze for Aluminum

Giving aluminum the deep freeze treatment just prior to machining has saved the Power Products Division of Canadian Westinghouse Company, Ltd., nearly $40,000.

Previously, the company used a three-stage technique in machining castings. There was a 24-hour "rest period" between the machining operations. Thus the casting had to be set up and machined three times and thus undergo a 48-hour delay before finishing.

Under the new method, the castings are heat-treated, then deep-frozen for four hours just before machining. Instead of the three-time cycle there is only one set up. The casting is machined to 0.010/0.015 in., then finished to specification.

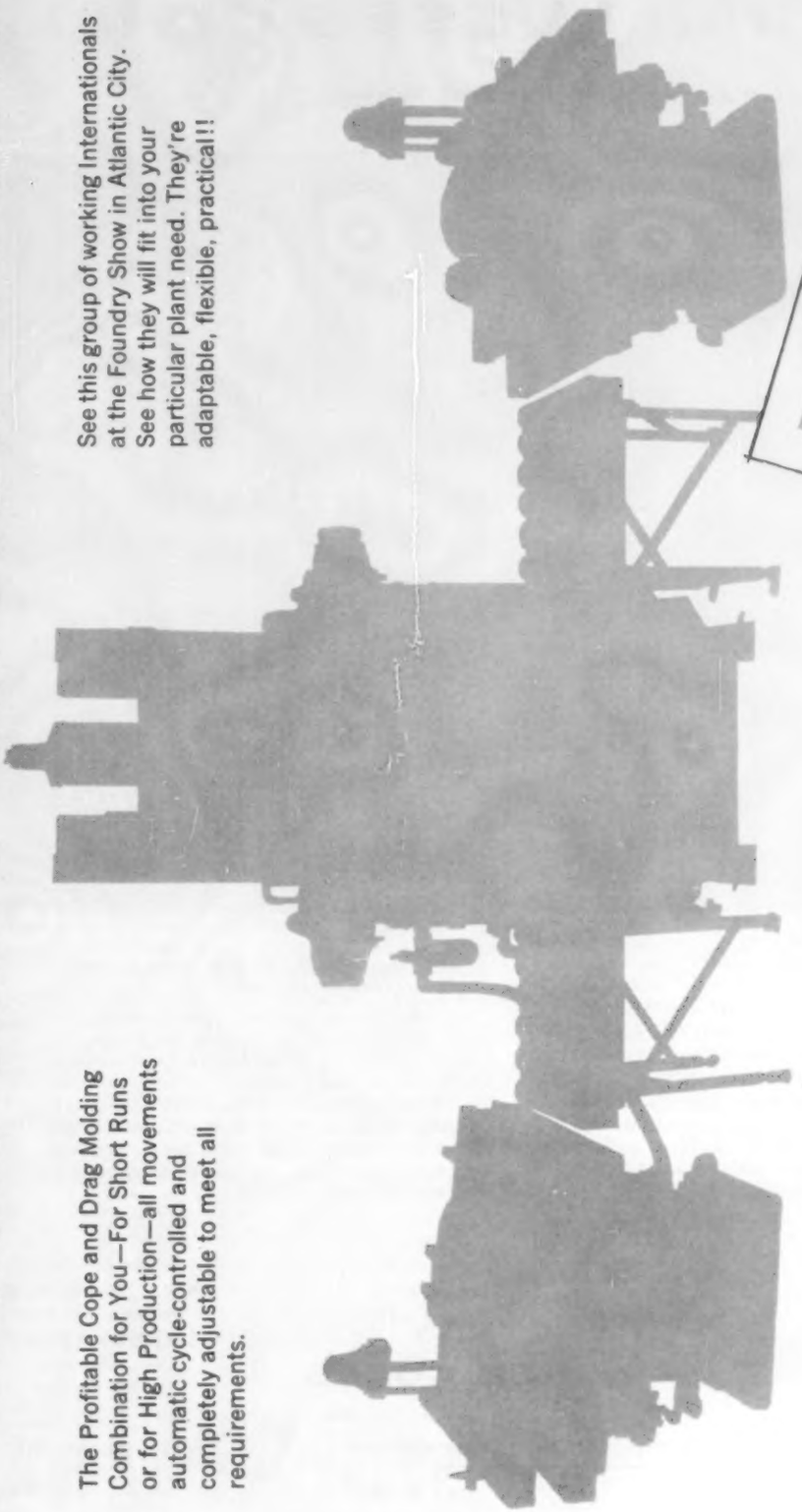
The aluminum alloy is Alcan 135-T22 and 350-W and the castings are used for generating, transmitting and electric power requirements.

CIRCLE NO. 233, PAGE 13-14

See INTERNATIONAL'S Push-Button OPERATION!

See this group of working Internationals at the Foundry Show in Atlantic City. See how they will fit into your particular plant need. They're adaptable, flexible, practical!!

The Profitable Cope and Drag Molding Combination for You—For Short Runs or for High Production—all movements automatic cycle-controlled and completely adjustable to meet all requirements.



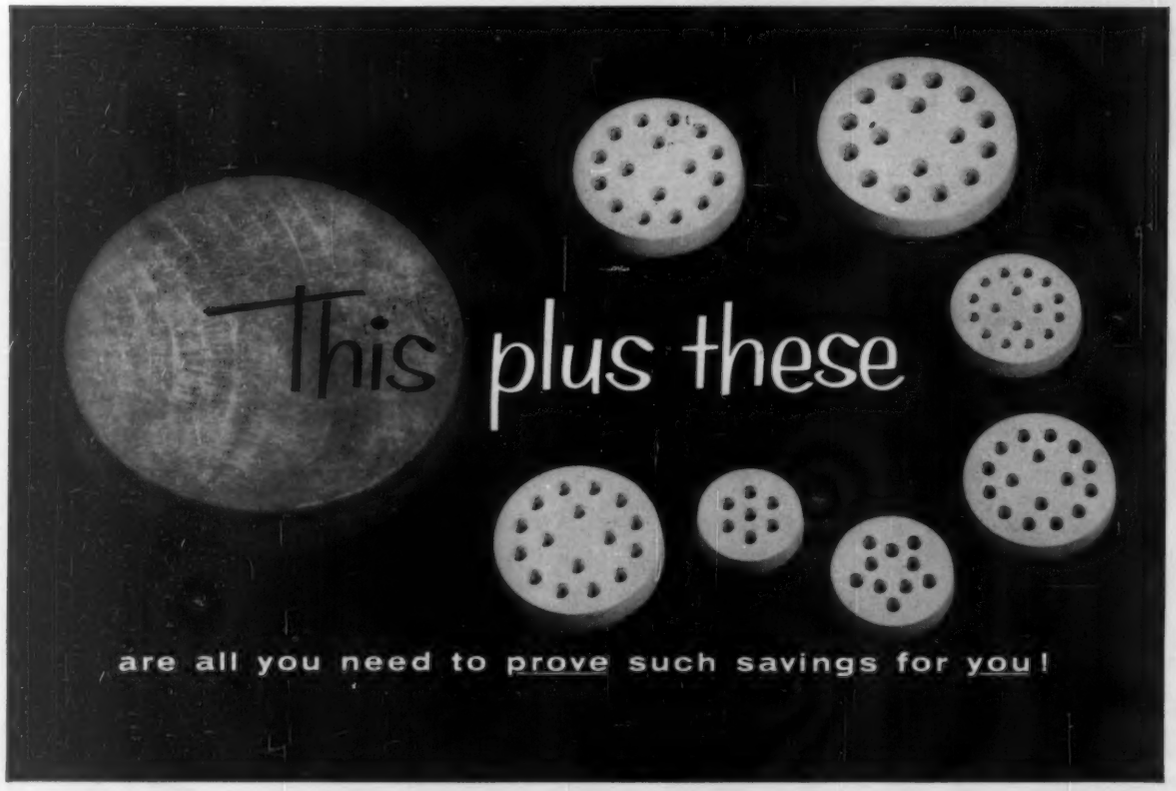
We Cordially Invite You... TO VISIT OUR SPACE 1422 DURING THE FOUNDRY SHOW ATLANTIC CITY, MAY 2 TO 6 We will be looking for you!

INTERNATIONAL MOLDING MACHINE CO. LA GRANGE PARK, ILLINOIS

Louthan strainer cores

CUT SCRAP LOSSES IN HALF!

save up to 75% in casting "rework" costs!



Something new has been added . . . to help you prove through comparative tests that Louthan Refractory Strainer Cores will save you money. If you are still making and using *sand* cores, your savings can be really substantial—through cutting scrap-losses in castings and reducing "rework" costs.

Louthan Refractory Cores keep slag and sand-core inclusions out of castings, and permit closer control of the molten metal. They withstand 3000° F. temperatures without spalling or disintegrating. You'll also find them exceptionally uniform, dimensionally accurate, easy to handle, simple and economical to use.

To help you make comparative tests in *your* plant, under normal production conditions, we now have *core prints* of our standard strainer cores which can be easily attached to your patterns. We'll be happy to *give* you these and a reasonable quantity of the matching strainer cores. Simply tell us your sprue diameter (or in-gate size) and we'll send them to you. Your only obligation is to *try* them and judge the results for yourself!

WRITE FOR
FREE SAMPLES
OR LOOK US UP AT
BOOTH 2011
ATLANTIC CITY
MAY 3 — 9, 1958

Louthan REFRACTORY STRAINER CORES

Louthan Mfg. Co., East Liverpool, Ohio (Subsidiary of FERRO® Corporation)

REPRESENTATIVES: M. A. BELL COMPANY, St. Louis 2, Mo. . . . Houston 3, Texas; FOUNDRY SUPPLY COMPANY, Minneapolis 16, Minn.; MILWAUKEE CHAPLET & SUPPLY CORP., Milwaukee 15, Wisc.; FREDERIC B. STEVENS INC., Detroit 16, Mich. . . . Indianapolis 7, Ind. . . . Buffalo, N. Y.

CIRCLE NO. 234, PAGE 13-14

products and processes

continued from page 20

hub. Cutting edges in the side walls keep the cut clean and let all the power go into productive work. "Tuffie" is available in 12, 14, and 18" diameters. *Eveready BrikSaw Co.*

CIRCLE NO. 81, PAGE 13-14

Shell molding system, automatic in operation, includes a 4-station shell molding machine, core setting belt

conveyor, closing machine, trolley conveyor for finished shells. System can turn out 240 shells per hour. *Link-Belt Co.*

CIRCLE NO. 82, PAGE 13-14

Rotary air grinder Model 25G weighs 2 lb, takes 1-3/4" wheels, operates at 20,000 rpm on 90-psi air pressure. Attachments fit it for other jobs equally well. *Thor Power Tool Co.*

CIRCLE NO. 83, PAGE 13-14

Trip balances have many advance features, including box-end beam construction, recessed balance adjust-

ment nuts, self-aligning agate bearings, precision ground steel knives, undivided tare beam and poise. Ask for "Harvard" catalog. *Ohaus Scale Corp.*

CIRCLE NO. 84, PAGE 13-14

Shakeout system picks up flask, carries it to shakeout station, then vibrates the sand loose in a few seconds. Three vibrating crane beam and hanger models have capacity to

5000 lbs and are custom-built. *Syntron Co.*

CIRCLE NO. 85, PAGE 13-14

Wet dust collector atomizes water and mixes it with air stream to give efficient dust transfer by air movement without mechanical means. Air

is then dewatered for discharge. "Ventrijet" system handles from 1000 to 30,000 cfm. *Pangborn Corp.*

CIRCLE NO. 86, PAGE 13-14

Royalty-Free Patents

Description of more than 900 Government-owned patents and how private business can obtain their ordinarily non-exclusive use without royalties to the inventor or the Government are given in the *Patent Abstract Series Supplement* just published by the Office of Technical Services.

This brings up-to-date the seven previous volumes of the series by listing patents acquired from January 1954 through June 1955. Many patents require only a minimum of technical development.

PB 111854 *Patent Abstract Series Supplement* lists 905 abstracts on 134 pages and costs $3.75; can be ordered from OTS, U. S. Department of Commerce, Washington 25, or from their nearest field office.

Other volumes of possible interest to foundrymen are PB 111464 *Instrumentation*, $2; PB 111467 *Metal Process and Apparatus, Machinery, and Transportation Equipment*, $2; PB 111469 *Ordnance*, $2; and PB 111470 *Ceramic, Paper, Rubber, Textile, Wood, and Other Products and Processes*, $1.

Ask Crucible Steel about shell molding with General Electric shell resins and you'll get a glowing report on *better castings at lower cost!* For Crucible finds the shell process ideal for casting parts in its new Rexalloy*—a super-hard alloy that's too tough to machine easily, too expensive to waste through machining allowances. Shell-molded Rexalloy parts are often usable as cast—far smoother and sharper than conventional sand castings—much less expensive than investment castings. To obtain these benefits, Crucible uses G-E shell resins, relying on them for batch-after-batch uniformity and properly balanced properties.

*Reg. trademark, Crucible Steel Company of America.

How can shell molding help YOU?

General Electric offers a number of products to help foundrymen get maximum benefits from the shell process: *G-E phenolic shell-molding resins* to form light, dimensionally accurate molds . . . *G-E silicone release agents* to free molds easily from patterns . . . *G-E phenolic bonding resin* to cement shell halves together.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Ask G. E. about shell molding!

General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

FREE SHELL-MOLDING MANUAL!

General Electric Company
Section 6F381
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*
( ) We are presently using the shell-molding process.
( ) We are interested in the shell-molding process.

Name _____
Firm _____
Street _____
City _____ Zone ____ State ____

CIRCLE NO. 235, PAGE 13-14

local foundry news

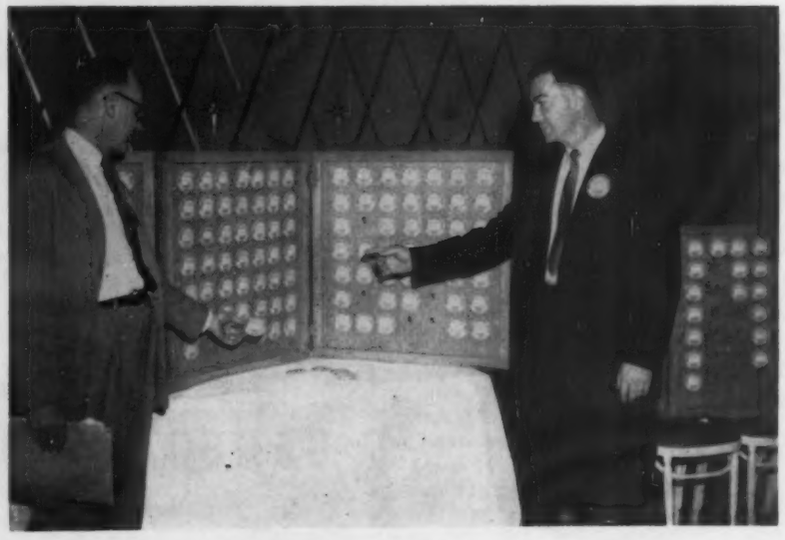
Central Illinois Chapter has established a technical library for the use of chapter members. The 20 volumes that initiated the project were displayed at a chapter meeting and made available for a one month loan. The librarian, chapter educational chairman, will also accept orders for the purchase of books. At the first meeting three books were borrowed, nine sold and six ordered. The chapter reports that it expects to sell at least 40 books a year and to keep the library in constant circulation.

WALT NAPP, DELTA OIL CO.

Wisconsin Chapter was recently entertained by the Belle City Glee Club, one of the state's best known male vocal organizations. This group of men from Belle City Malleable Iron Co., Racine, is now in its tenth year and has appeared on radio, TV and in music festivals. Shown is a quartet from the club. Left to right: H. Amland, R. Burns, H. Grzeskoviak and R. Gresser.

Fillers, inhibitors, accelerators and proper water supply as vital factors in preparing plaster for patterns were explained to the members of the **Toledo** Chapter by Fred Chambers of National Gypsum Co.

Michiana Chapter's speaker, J. H. Smith, did double duty by drawing for the door prize when he came to tell about General Motors new accomplishments in shell molding.



At **Metropolitan** Chapter, Bob Hunter, left, and Bob Munn check new boards displaying members' ID badges. Worn for meeting, badges are checked when leaving.

Judging by the expressions on the faces around **Chicago** Chapter's registration table, the crowd is so big that these fellows will have a hard time getting in. In the meanwhile, back at the **Northeast Ohio** Chapter, membership chairman Jim Schwalin is making plans with his active group. Chicago and the Cleveland outfit are in a race to be largest AFS chapter, but both agree on the value of introducing students to AFS activity. Chicago hosts Roy Schroeder's Illinois students regularly, while the young men at the lower right are Case Institute FEF students who were recently feted by Northeast Ohio. Students, left to right, are: Jim Tripp, Bob Hlavin, Franz Sammt, Harold Gurev, Ken Fetheroff, Edwin Rooy and Jim Baldwin.

AFS and ASM student groups held a joint meeting at **Michigan State** and these were the wheels. Left to right, Rennie Swope, ASM; Richard Dobbins, industrial advisor, Albion Malleable; Arthur Karpicke, speaker, Saginaw Malleable; and Jack Lane, AFS.

Dan Krause, left, and D. C. Williams held "Pistols at ten paces" on casting defects at the **Central Ohio** Chapter meeting.

Howard F. Taylor, MIT, gave **Connecticut** Chapter members the latest word in "Chemistry and Mechanics of Molding Materials." Included was this demonstration showing the expansion of a mass of close-packed sand when deformed. See story on page 60.

Aye! Bob Smith, Smith Steel Castings, registered an enthusiastic vote when the **Texas** Chapter met in Beaumont to hear N. Birch.

local foundry news is continued on page 144

For Permanent Marking

use Markal PAINTSTIKS

HANDY AS A PENCIL

FADE-PROOF

WEATHER-PROOF

LONG MILEAGE

VARIETY OF COLORS

ANY TYPE SURFACE... HOT OR COLD

Cold: — 40 to +150 F.

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Write For Free Sample and Brochure . . . State Marking Conditions.

Engineering Service Available. Consult us for any type of marking problem . . . no obligation.

Markal COMPANY

3093 West Carroll Ave. Chicago 12, Illinois

CIRCLE NO. 236, PAGE 13-14

another new Aerovent achievement

reversible rotation adjustable air discharge

centrifugal materials handling fans

MH

New Aerovent "MH" Fans, designed primarily for use in conveying production and waste materials, are also effective for dust, fume and gas removal in foundries, mills and general industrial areas.

Available in 19", 26", 33", 40" and 51" wheel diameters, these units are adjustable for angular, horizontal or vertical air discharge and reversible for either clockwise or counter-clockwise rotation.

Standard units furnished less motors, belts, and sheaves. Appropriate drive units and accessory equipment available for all operating requirements.

write for new free folder M-700

Aerovent Fan Company, Inc.

Ash and Burch Streets Piqua, Ohio

for cooling • drying • exhausting • fume dispersal • heat transfer

CIRCLE NO. 237, PAGE 13-14

Detroit Chapter devoted the March meeting to a tour of the Ford Motor Co.'s Dearborn Iron Foundry. The men shown strolling through the aisles of the plant first fortified themselves in the Ford cafeteria. To show their appreciation for the visit, the chapter presented plant manager John W. Schneider, seated below, with a set of bookends. Chapter vice-chairman John Nabrezny, Michigan Malleable Iron Co., handled the presentation.

Metal Minded Librarians

Sources of technical information for metals specialists are often tended by special librarians who are members of the metals division, Special Libraries Association. This group will hold its annual convention at the Hotel William Penn, Pittsburgh, June 4-7.

Included in the convention program are visits to the research laboratories of Aluminum Company of America, United States Steel Corp., Westinghouse, Jones and Lughlin, and Pittsburgh Consolidation Coal Co.

The theme of the general conference is "Putting Knowledge to Work" and "Creative Thinking" is the subject for the metals division program for Monday afternoon, June 4.

Television Casting

Bad jokes about "casting directors" and "casting offices" not withstanding, the metal castings industry has made its way to the silver screen of television.

"The Challenge of the Foundry Industry" was presented to TV viewers Sunday, March 25 over KYW-TV, Cleveland. Purpose of the program was to interest and enlighten both laymen and foundry workers. The program was sponsored by the educational committee of the Northeast Ohio Chapter of the American Foundrymen's Society in cooperation with the Cleveland Technical Societies Council.

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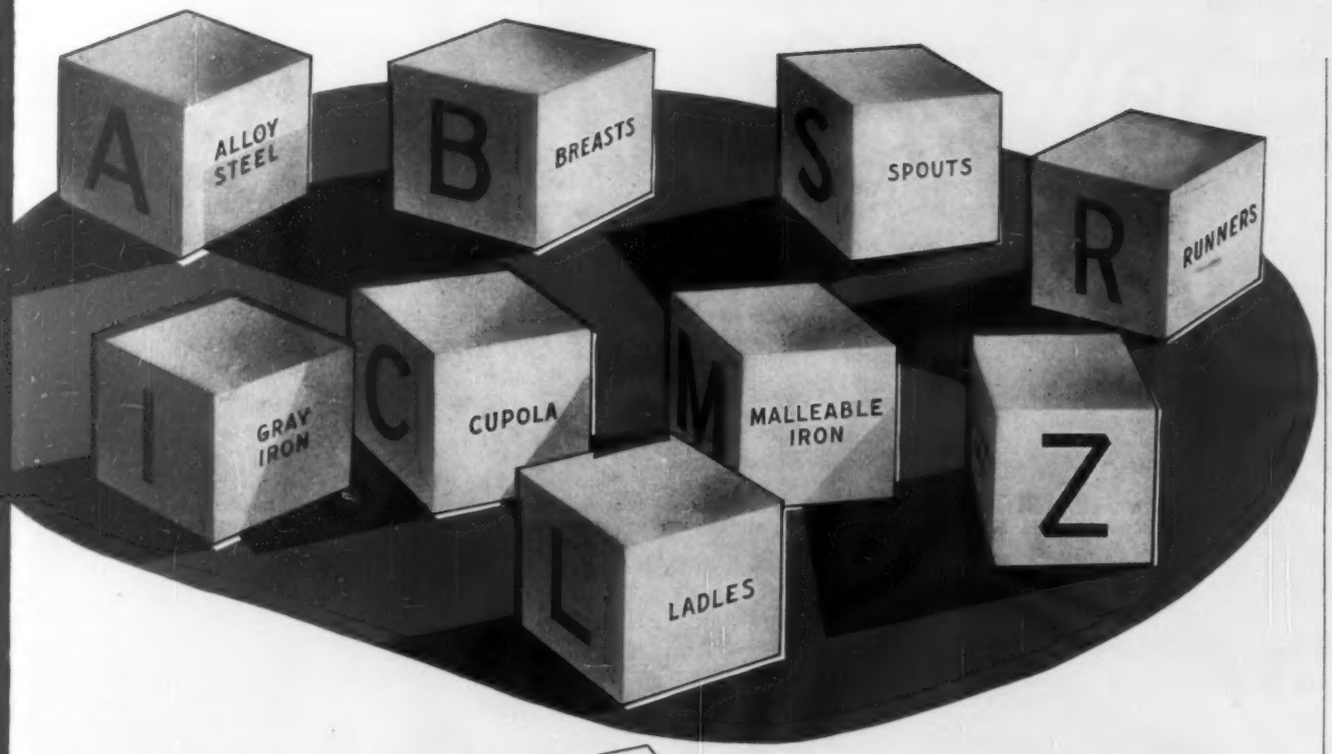

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You are invited to meet "MR. HELSPOT" in Booth 1313 at the A.F.S. Convention in Atlantic City, May 3 through May 9.

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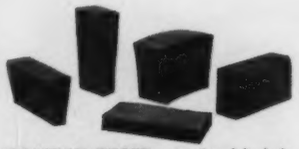

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Martin Lefler Dies

■ Martin J. Lefler, 59, plant manager, Oliver Corp., South Bend, Ind., died April 6.

He was born in Boyne City, Mich., and graduated from Michigan State College in 1922. Following graduation he began his foundry career with Deere & Co., Moline, Ill., as foundry superintendent in 1924. In 1927 he went with J. I. Case Co., Racine, Wis., as assistant foundry superintendent and in 1930 joined Oliver Farm Equipment, South Bend, Ind. He remained there until 1936 when he went with Western Foundry Co.,

M. J. Lefler

Chicago, as general superintendent and vice-president. In 1943 he managed Strom Brass Foundry, Elkhart, Ind., where he remained until 1947 when he went with Oliver Corp. in the capacity of plant manager.

Mr. Lefler served in the army in World War I as a second lieutenant. He was chairman of the United Fund in South Bend and was vice-president of the Association of Commerce.

Active in the American Foundrymen's Society for many years, Mr. Lefler was chairman of the Michiana Chapter for 1939-40 and elected a national director for a three-year term in 1953. He was also vice-president of Region No. 2 of AFS, and a member of the Publications and Chapter Contacts Committees.

Mr. Lefler leaves his wife, son James, and daughter Joanne Stefcza (Mrs. Alex).

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Don't Throw $$$ Away In the Furnace

HAROLD W. LOWNIE, JR. / *Asst. Supv.*
Battelle Memorial Institute
Columbus, Ohio

■ An intelligent metallurgist with the ability and authority to adjust his cupola charges can save a foundry appreciable money by close observation of pig and scrap prices on the local market.

The price of pig, an important item in the cost of operating an iron foundry, is determined by: (1) the manufacturer's cost of assembling the raw materials and producing the desired grade of iron; (2) freight costs between the manufacturing plant and the foundry; (3) the price of competitive materials such as iron and steel scrap.

The common elements that affect the price of pig iron are phosphorus, silicon, and manganese. Phosphorus is so important that it is used as the basis for the classification of pig iron. In general, the lower the phosphorus the higher the cost and for this reason foundries should use higher phosphorus irons whenever possible from a metallurgical viewpoint. Foundries making high phosphorus irons might be able in some cases to use basic pig iron and obtain a saving over the use of foundry or malleable pig. Pig irons are sometimes subject to a reduction in price for phosphorus contents of 0.70 per cent and over.

Silicon and manganese in pig iron both cost money. The price of silvery pig is increased $1.00 per ton for each additional 0.50 per cent silicon over the base grade, and other irons are increased 50c per ton for each additional 0.25 per cent silicon over base grade. Base prices for non-silvery grades are increased 50c per ton for each 0.50 per cent of manganese over 1.00 per cent.

When a foundry determines the minimum cost of pig iron, freight rates must be considered. Usually pig from the nearest producer will be cheapest, but the nearest producer may not market the particular grade desired.

Freight rates are determined from rather complicated schedules, but a rough approximation of freight costs between usual points of shipment is about as follows:

Miles	Approx. Carload Rate $ / gross ton
1	1.50
50	2.50
100	4.50
200	6.75
400	8.00
600	8.75

Pig iron is not the only raw material that interests foundries. Others are cast iron scrap, steel scrap, and coke.

Market prices for foundry melting stock are affected by many factors, many of them on the local level. These factors include general business conditions, competition of demand by the steel industry, and changes in local markets.

By paying attention to the changing local delivered price of each raw material, furnace charges can often be cheapened. For example, the amounts of pig iron, steel scrap, and coke in a cupola charge are related. When pig iron is expensive in relation to coke and steel, the cheapest charge will usually be low pig, high in steel, and will use a

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rich coke ratio. When pig iron is cheap in comparison with steel and coke, the most economical charge will often be high in pig, low in steel, with a lean coke ratio.

There are mathematical methods for calculating the charge of lowest cost under any given set of market conditions and average charge composition desired.

Pig iron and foundry coke are both at their highest prices in 1956, but there has been fair consistency in the relation between the prices of these materials since 1930. For example, although the cost of foundry pig iron at Chicago has increased from $15.50 per gross ton in 1933 to $59.00 in 1956, and the price of foundry coke at Chicago has increased from $7.00 per ton in 1933 to $25.75 in 1956, the price of pig iron at Chicago each year has fluctuated around an average close to 2.2 times the cost of foundry coke. The extremes were in 1944 and 1945 when pig iron cost only 1.91 times as much as coke, and in 1930 and 1951 when pig iron cost 2.50 times as much as foundry coke.

The relationship between the prices of foundry pig iron, cast iron scrap, and steel scrap has been much more erratic than the relationship between pig iron and coke. Therefore, it is in adjustment of pig iron, cast iron scrap, and steel scrap in charges that the foundryman has a great opportunity to reduce his costs.

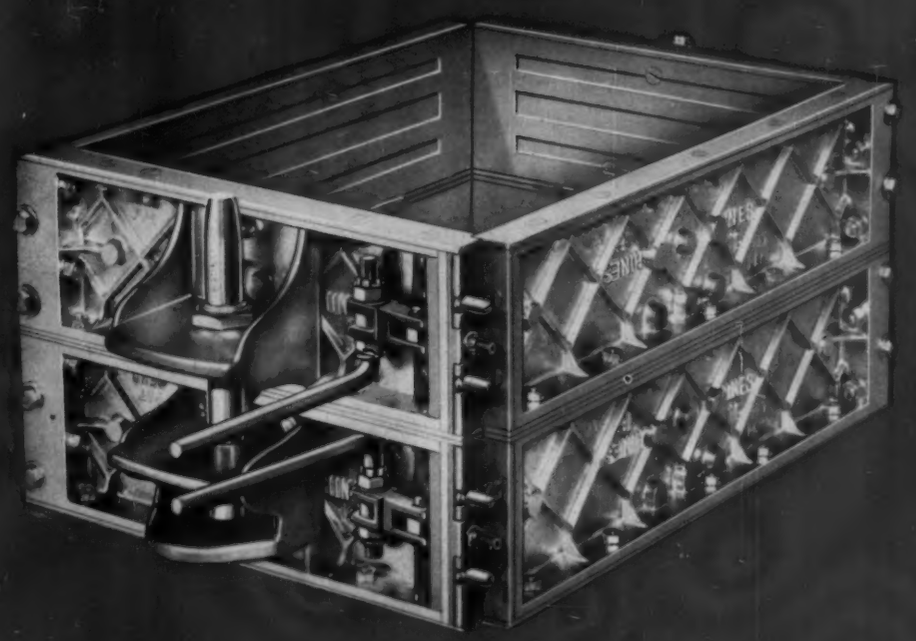
Foundry pig often costs about 50 per cent more than good cast iron scrap. This was the situation in 1954. In 1948, however, foundry pig at Chicago was selling for almost half the price of cast scrap. This was obviously the time for high-pig charges—if you could get pig iron!

At the other extreme, in 1933 pig iron at Chicago cost over twice as much as good cast scrap and low-pig charges were indicated. Major variations like this suggest obvious changes in metal charges at the time, but foundrymen often overlook the fact that local changes in prices are constantly occurring, and that continual cooperation between the purchasing agent and metallurgist can save the foundry real money.

In 1954, steel scrap was selling at a comparatively low price, much lower than in 1951, 1952, or 1953.

HINES

announces ITS NEW



PATENTS PENDING

This new, straight-wall, Hines "HINGE-OFF" flask is recommended for hand and mechanical molding of loose, match plate and cope and drag plate patterns, up to 20″ in length. Made of light weight metal, it maintains alignment because it will not warp from absorbing moisture and drying, as in wood flasks. No wood screws to work loose! Accurate pins and guides and pin center alignment! And, it is provided with a positive, fast-acting, locking mechanism that aligns and locks the open end perfectly and rigidly, to prevent shift!

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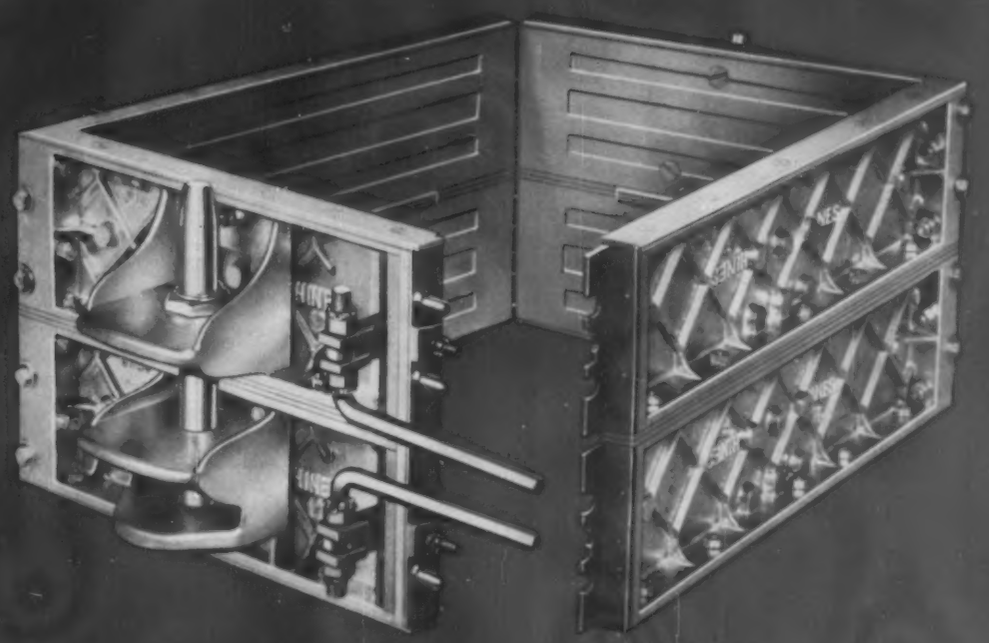

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It is obvious that this was a time for high steel charges, where they could be used. Since 1954, however, the price of steel scrap has increased steadily nearer to the price of pig iron, because of increasing exports of steel scrap and increased competition from steelmakers.

■ **Gray iron.** Most gray iron is melted in cupolas using coke as a fuel to melt a metal charge of pig iron, cast iron scrap, and steel scrap. The amount of coke is usually between 7 and 15 per cent of the weight of the metal charge. Typical charges for gray cast iron contain from 10 to 40 per cent of pig iron, and up to 40 per cent of steel scrap. About 40 per cent of the metal charge in many foundries consists of foundry returns such as scrapped castings, gates, and risers.

Cupola charges are compounded on the basis of the amount of the major elements in each component, the cost of each component, the composition of the iron desired after remelting, and the loss or gain in each element during melting. Detailed discussion of this is given in chapters 2, 9, and 27 in the AFS publication THE CUPOLA AND ITS OPERATION issued in 1954.

■ **Nodular iron.** The compounding of metal charges for manufacture of nodular iron castings follows the same general pattern as for gray iron, but closer attention must be given to several factors involving the primary elements carbon, manganese, phosphorus, and sulphur. These factors are such that it is common practice to use a higher percentage of pig iron in the charges for nodular iron than in the charges for gray iron.

Carbon, in the form of tightly packed spheroids in nodular iron has a much smaller weakening effect than graphite in the form of sprawling flakes in gray iron. For this reason nodular iron castings often contain more carbon than gray iron castings, so that advantage can be taken of the higher castability and fluidity imparted by high carbon content. To obtain high carbon in the melted iron, it is common to use large percentages of high-carbon pig, or to melt in a cupola with a basic slag so as to promote carbon pickup by the iron.

Magnesium is the usual additive made to the molten iron to produce the spheroidal graphite. Mag-

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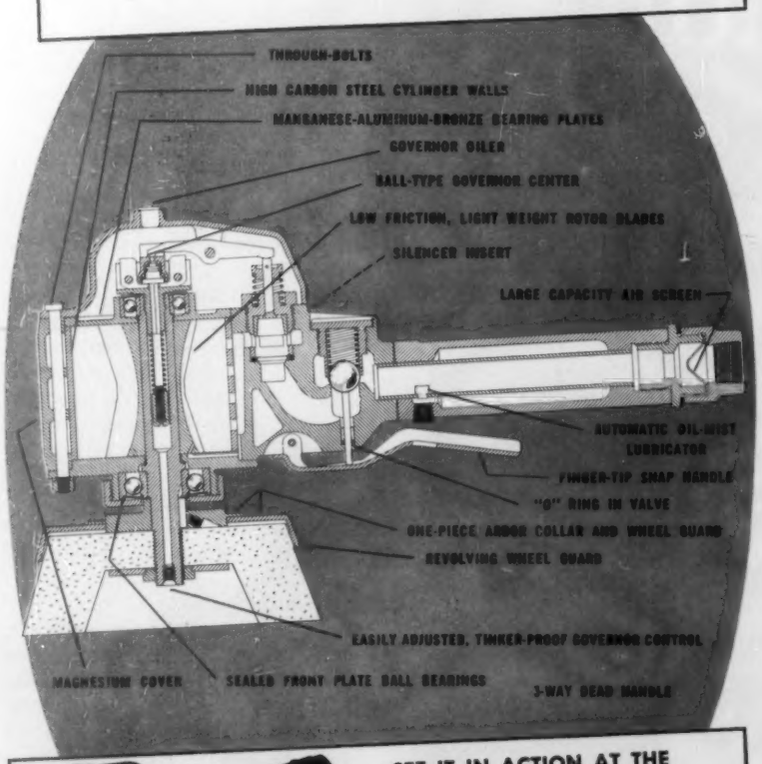

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nesium is effective in either hypoeutectic or hypereutectic irons, if added in suitable amounts. The spheroidal graphite is also produced by treatment with other metals, notable cerium. If cerium is used, however, the iron must be hypereutectic. This makes control of the carbon content much more important than for magnesium-treated irons.

■ **Malleable iron.** Main problem in the manufacture of malleable iron castings is to control the primary and secondary elements so as to prevent the formation of primary graphite during the solidification of the casting, and to promote the graphitization of iron carbide during annealing. As in the case of nodular iron castings, the close control required in the manufacture of malleable iron often calls for the use of fairly large percentages of pig iron in the charge. An advantage of pig iron is its known composition, something not known for most scrap. Pig iron is also low in undesirable elements such as phosphorus, sulphur, and carbide stabilizers that can cause trouble during annealing.

Carbon and silicon are the main elements which affect the final properties of malleable. The influence of other elements is mainly on the speed of graphitization of the iron. Some elements perform dual roles—as graphitizers if present in small quantities and as retarders if present in larger amounts. It is often possible to offset the retarding effect of one element by the graphitizing effect of another. These combinations, however, must be intelligently used and carefully controlled.

Most malleable iron is melted in air furnaces. Some is melted by duplex processes, for example, by melting in a cupola and refining in an air furnace, open-hearth furnace, or electric furnace. A typical metal charge for an air furnace might contain 30 per cent pig, 50 per cent remelt from the foundry, 10 per cent purchased malleable iron scrap and 10 per cent steel scrap. The pig iron is selected on the basis of its low phosphorus content (0.20 per cent maximum) and freedom from harmful incidental elements. The components of the metal charge are selected and blended together after taking into considera-

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tion the changes in carbon, silicon, and manganese content expected during melting.

Over a period of many years, foundrymen have observed that there is a tendency for the microstructure and the properties of some pig irons to be repeated in iron castings, even though the composition and cooling rate of the castings are quite different from those of the pig iron. This effect is called "heredity," and there have been many attempts to explain it.

The list of names of men who have tried to determine the causes of heredity in pig iron reads like a "Who's Who" of the castings industry. Many recognized the effect and some felt that there are so many elements and compounds which could be present in pig iron and not be detected by conventional analyses, it was not surprising that the effects of some of these materials could be carried through remelting operations.

Out of years of experimentation two conclusions stand out:

1. There are often characteristics or properties of pig iron which carry through remelting operations.

2. This hereditary effect has not yet been explained by chemical composition or by any existing theories.

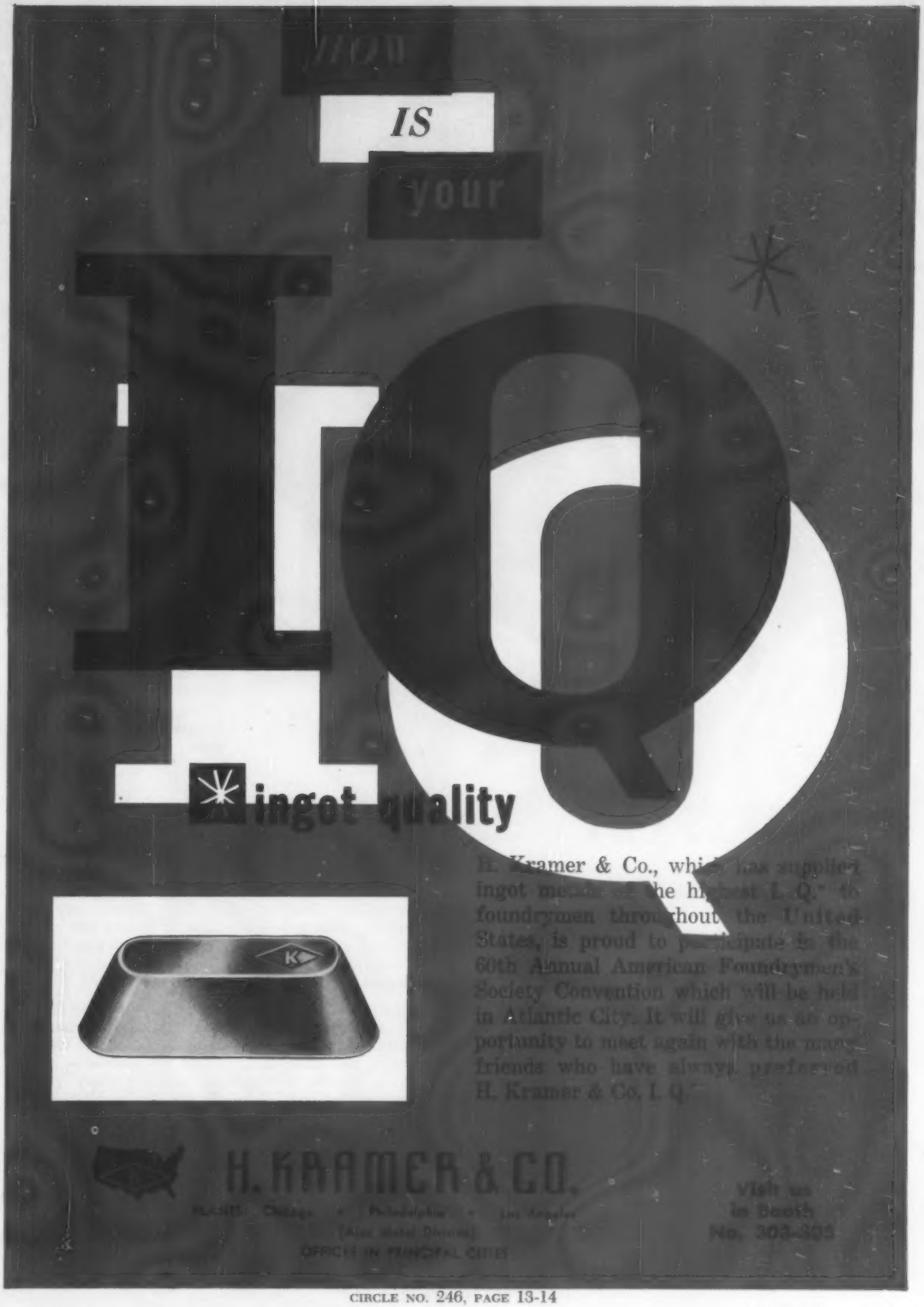
Three main theories have been developed. Each has its adherents, but neither explains all the effects that have been observed. These theories, briefly stated, are:

1. The nature and behavior of the graphite in different pig irons differ. Some pig irons contain graphite which is little affected by remelting operations, and other pig irons contain graphite which dissolves during similar remelting so that it will not nucleate the precipitation of graphite during solidification (or during annealing in the case of malleable iron).

2. Some pig irons contain a "slime" of ferrous silicates which pass through remelting operations and nucleate the formation of graphite flakes, while other pig irons do not contain this "slime," hence do not graphitize so readily.

3. The behavior of pig iron during melting is influence by the presence or absence of dissolved gases.

In a seven year study at Battelle Memorial Institute, pig irons from a number of sources were melted



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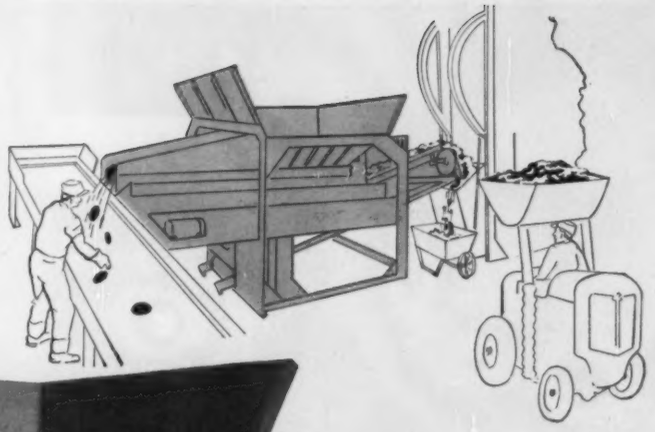

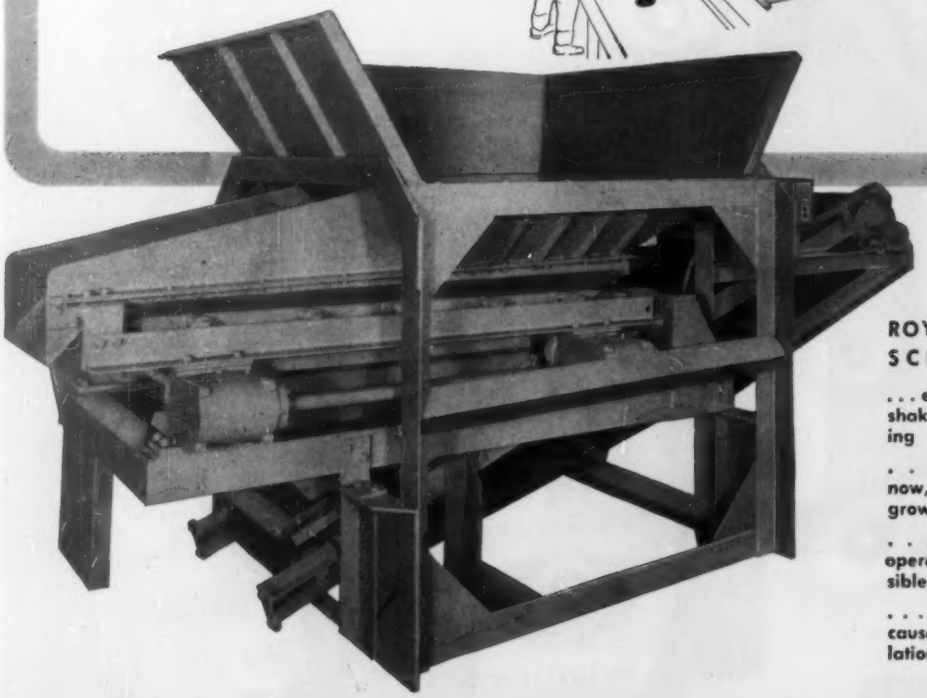

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and remelted in different types of melting units. The pig irons were used to produce gray irons, white irons, and malleable irons. Tests were made by conventional methods of chemical analysis, spectrographic analysis, and vacuum-fusion analyses for gas contents. The pig irons and their products of remelting were tested and examined for metallographic structure, shrinkage characteristics, strength, annealability, chill depth, response to inoculation, tendency to hot tear, castability, density, and about every other test that anyone could think of at the time.

Attempts were made to reproduce or influence the characteristics of the pig irons by adding to them many different types of materials. The program involved over a dozen pig irons, including charcoal pig and some other special types. Literally thousands of tests were conducted, and the results were evaluated statistically. Out of this program came the indisputable fact that pig irons do have characteristics which persist to some extent regardless of the type of melting unit employed or the type of cast iron produced. Furthermore, the study showed that at least some of these characteristics were established in the pig iron *before* it was cast into pigs.

Although the study revealed methods by which the behavior of the pig iron could be influenced during remelting, it was not able to explain conclusively the reason for the hereditary effect. Today we are not much further along in our knowledge but steady pecking away at the problem has led most investigators, including the author, to believe that hereditary characteristics of pig iron will be understood some day if experimentation is continued.

When the explanation does come, it may be on the basis of chemical composition, or something equally simple. Many of us will wonder why we were so blind as to miss an obvious explanation, and we will realize that we were right on top of an answer all the time.

Excerpted from the paper *"Use of Pig Iron in Iron Foundries (with Particular Attention to Specifications, Costs, Residual Elements, and 'Heredity')"* to be presented at a Gray Iron session of the 60th AFS Castings Congress in Atlantic City, May 3-9.

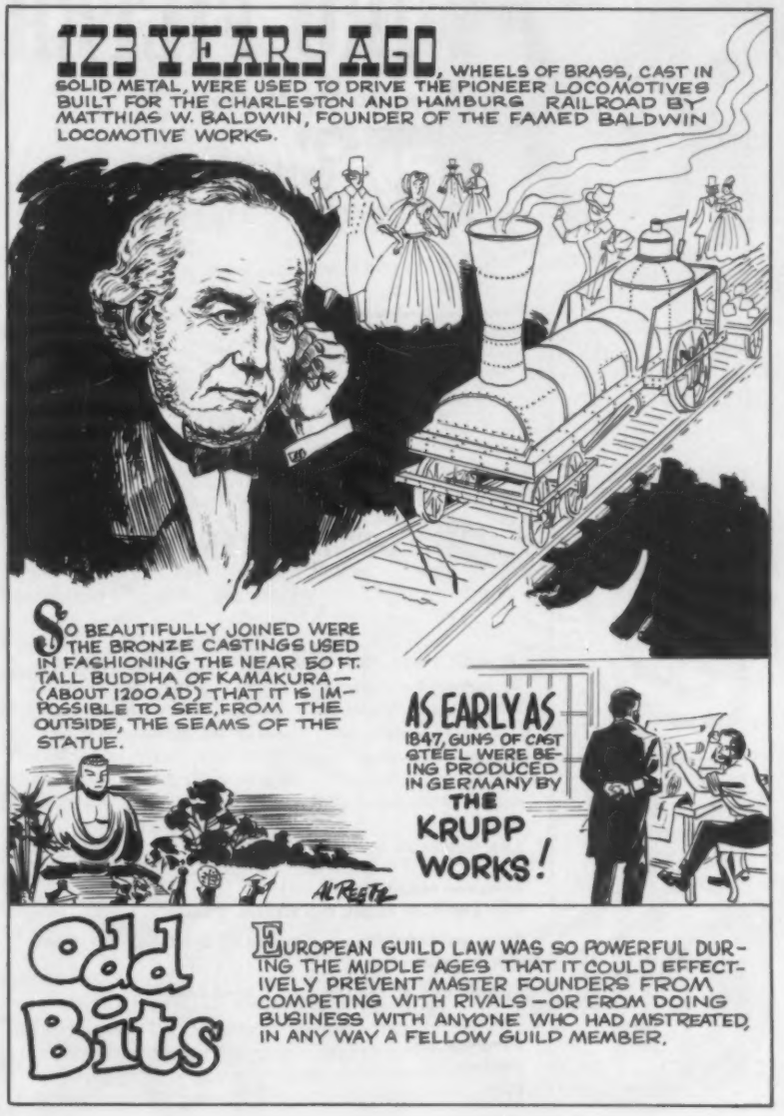
Analyzing Titanium

Recommended methods of analysis for determining various elements in titanium and titanium alloys are contained in a report of a metallurgical advisory committee of the Watertown Arsenal, U. S. Army Ordnance Corps.

This report, part of a larger continuing study, has just been released through the Office of Technical Services, U. S. Department of Commerce.

The report, PB 111730 *Metallurgical Advisory Committee on Titanium, Recommended Methods of the Panel on Methods of Analysis, Watertown Arsenal,* May 1955, 70 pages, may be obtained from OTS, U. S. Dept. of Commerce, Washington 25, price $2.

casting through the ages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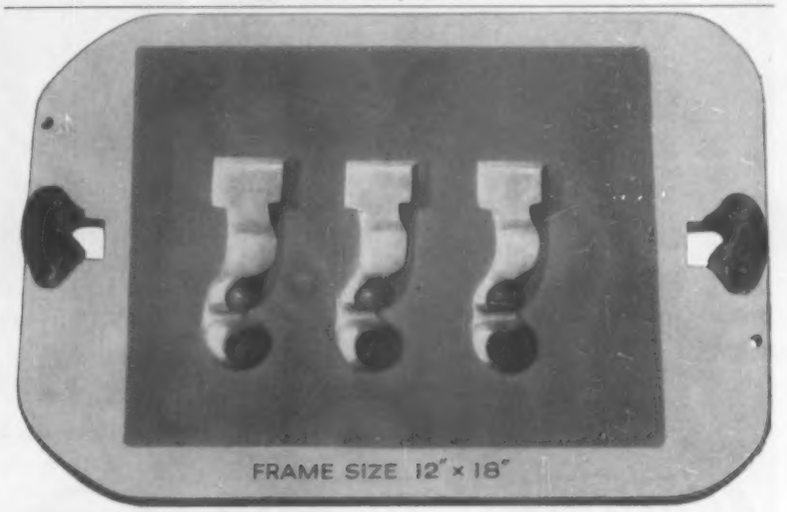
CIRCLE NO. 248, PAGE 13-14



"The type of work we produce in TAMASTONE we would be unable to make at all in the absence of skilled help!"

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This Drier equipment pattern is for a port core box on a diesel engine and is made from an original master pattern. *Only one shrinkage!* Material is aluminum. Pattern was used for 100 Driers. Only 2 hours labor and 20 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

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CIRCLE NO. 249, PAGE 13-14

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When you specify Colonial brass, bronze and aluminum ingots.

We'll be glad to see you at the Foundry Show, May 3-9, in Atlantic City—**Booth 336.**

Colonial Metals Co.

COLUMBIA, PENNA.

Producers of | Specification Brass, Bronze and Aluminum Ingots

CIRCLE NO. 250, PAGE 13-14

Why You Should Order Sand By Sieve Analysis

■ Many of the commonly used terms in ordering sand lead only to confusion and entirely different final results than expected. The AFS Grading, Fineness and Distribution Committee, Sand Division, believes that sand should be purchased on the basis of sieve analysis, with tolerances agreed upon by the sand producer and the sand purchaser.

Terms used in the past were not standard or sufficiently descriptive. Terms such as "four-screen sand," do not necessarily mean the same things to sand producers as to buyers, and have little value as a means of purchasing. The three examples here show why.

Ordering Sand By Screens

All three sands here are so-called "four-screen" sands. They do not produce sand mixtures with the same properties, given the same treatment in the plant, since the distribution is different.

	Per Cent Retained		
U. S. Sieve	Sand A	Sand B	Sand C
20	0.1	0.1	-
30	2.3	2.3	-
40	29.3	10.6	-
50	31.3	19.2	2.4
70	19.2	31.3	29.3
100	10.6	29.3	31.3
140	4.8	4.8	19.2
200	1.4	1.4	10.6
270	0.6	0.6	4.8
Pan	0.3	0.3	2.3
AFS GFN	47.8	56.2	88.1
% passing sieve 140	2.3	2.3	17.7

Ordering Sand By AFS GFN

This is confusing and of very little value. The three sands below have an AFS GFN that is comparable. Treated the same, however, they do not produce sand mixtures with the same properties.

	Per Cent Retained		
U. S. Sieve	Sand A	Sand B	Sand C
12	-	20.0	-
20	-	28.0	1.0
30	-	1.0	4.5
40	1.7	-	5.8
50	13.2	-	17.5

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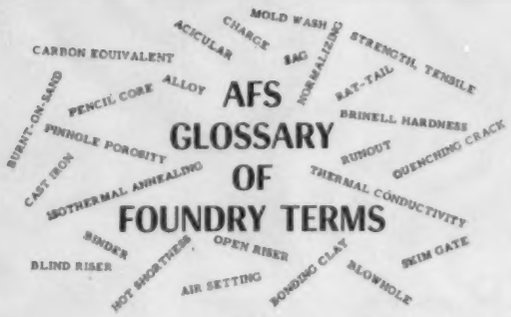
CIRCLE NO. 251, PAGE 13-14



Including almost 2000 terms, this book is intended to help standardize the meanings of foundry terms throughout the metal castings industry. In its preparation, reference was made to many presently existing glossaries and dictionaries of scientific and engineering terms. IT IS THE MOST COMPLETE WORK OF ITS KIND and should be at the finger-tips of every member of the metal castings industry. (80 pp. 6 x 9 Paper Bound.)

AFS MEMBERS $.75 NON-MEMBERS $1.25

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70	38.6	2.0	31.2
100	34.6	3.0	31.0
140	9.7	26.0	3.8
200	1.8	20.0	2.5
270	0.1	-	2.0
Pan	0.1	-	1.0
AFS GFN	62	61	61.1
% passing sieve 140	2.0	20.0	5.5

Ordering Sand By Peaks

Ordering sand by peaks only is equally confusing. Here are three one-peak sands. Again, with similar treatment in the plant they do not produce sand mixtures with the same properties.

	Per Cent Retained		
U. S. Sieve	Sand A	Sand B	Sand C
12	-	-	-
20	-	-	-
30	-	-	11.0
40	2.0	-	74.0
50	26.0	11.0	14.0
70	39.0	74.0	1.0
100	22.0	14.0	-
140	7.0	1.0	-
200	3.0	-	-
270	1.0	-	-
Pan	-	-	-

The committee's report has been accepted for consideration by the Sand Division Executive Committee as a tentative standard.

Syracuse Gets Library From Central N.Y. AFS Club

Syracuse University College of Engineering has been presented an 84-volume technical library by the Past Chairmen's Club of the American Foundrymen's Society Central New York Chapter.

The project was conceived by the late Frank C. Wheeler, charter member of the AFS chapter and president of the club at the time of his death. The project was completed by William D. Dunn, organizer of the club.

The books in the library consist of 68 volumes purchased from AFS and 16 donated by chapter members. A book plate in each book states that it was donated as a memorial to Frank C. Wheeler.

Dr. Hamnett P. Munger of the Department of Chemical and Metallurgical Engineering accepted the books for the school.

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Smelters and Refiners of Brass and Aluminum Alloys

CIRCLE NO. 252, PAGE 13-14

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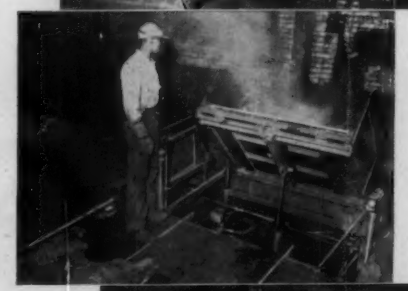

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CIRCLE NO. 253, PAGE 13-14

Die Hard Jones

Now, I'm not one to brag or boast
But I've been in shops from coast to coast,
And I'll swear by all Great Caesar's bones
There's thousands of critters like Die Hard Jones
Who go through life with a smile and a song,
But will never admit it when they are wrong.

A foreman was he, and a good foundryman
With a pleasant word and smile on his pan;
But don't cross him up, by day or night
For Die Hard Jones was always right.
The sand is littered with bleaching bones
Of men who argued with Die Hard Jones.

Whether ramming a mold or using a spray
You'd better be cautious and do it his way,
For use your own methods, you might hear him shout,
"If you can't do it right, then get the hell out!"
When working for Jones, the day that you're hired
Might turn out to be the day that you're fired.

The day of his downfall, 'twas rainy and cold;
We made ready to pour a big cutterhead mold.
Night boss shook his head and muttered, "Tain't right.
It's been setting below a big roof-leak all night,
Better dry that mold, don't pour it yet,
I'll bet five bucks that it's good and wet."

Then Die Hard Jones bawled, "Listen to me.
I'm the boss around here in the day time, see?
We'll soon find out which one is the wiser.
I know it's dry, 'cause I looked down the riser."
So we shrugged our shoulders and rustled our bones,
For you can't disagree with Die Hard Jones.

We tapped out the heat, and Die Hard said,
"Take her over and pour that there cutterhead."
With a hiss of steam and a rumbling roar
That mold blew up and left the floor,

The ground is marked for blocks around
Where sand and metal hit the ground.

We got a few burns, no broken bones,
But the only man laid up was Die Hard Jones.
From his hospital bed old Jones did cry,
"I know darned well that mold was dry.
Tell you what I think—them devils at night
Loaded that job with dynamite!"

And that is his story right up to this day.
"What made that cutterhead blow?" we'll say,
And Die Hard replies, "Why, you ignorant pup,
There was dynamite in the runner cup!"
In his heart he was right, and his whole life long
Die Hard Jones was never wrong.

From *Rammed Up and Poured*, book of foundry poems by Bill Walkins, former sand mill operator, editor of *The ESCO Ladle* of Electric Foundry Co., Portland, Ore.

Plan Michigan Regional

Michigan Regional Foundry Conference appointments have been announced along with dates of the meeting. Robert D. Dodge, Archer-Daniels-Midland Co., Detroit, has been named chairman of the conference to be held in the Union Building, University of Michigan, Ann Arbor, November 29 and 30.

Other conference officials are: vice-chairman and program chairman, Richard B. Kropf, International Nickel Co.; secretary, Prof. Richard A. Flinn, University of Michigan; treasurer, Prof. Wayne Kraft, University of Michigan; executive secretary-treasurer, Jess Toth, Harry W. Dietert Co.; publicity chairman, Ray Sutter, Sutter Products Co.; student activities chairman, Charles E. Drury, Central Foundry Div., General Motors Corp.; and banquet chairman, Gerald Strong, Battle Creek Foundry Co.

Michigan Regional Foundry Conference sponsors are the Detroit, Western Michigan, Central Michigan, and Saginaw Valley Chapters of the American Foundrymen's Society and the student chapters at the University of Michigan and at Michigan State University.

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. . . and, equally important, guidance along the course

That's what the American Foundrymen's Society has brought to the castings industry over the past 60 years

. . . the *power* that comes with sound technical knowledge

. . . the channeling of that *power* in the right direction

Progress requires that every faction, in all divisions, must constantly be familiar with new products and new processes to enable the entire field to maintain a competitive industrial position. Actually, the castings industry, like all other basic sources of mass-production manufacture, can advance only in direct proportion to the advancement of individuals within the field . . . in all of the various related phases of operation, from raw material to delivery of finished products.

Reliable technical knowledge must be augmented by contacts within the industry, for both companies and individuals. Consequently, the membership of the American Foundrymen's Society directly shares in the far-reaching benefits derived from: Committee Activities . . . National Conventions . . . Foundry Shows . . . Educational Activities . . . Safety, Hygiene and Air-Pollution Control Programs . . . Research Projects . . . Chapter Contacts . . . Regional Conferences . . . Technical Publications . . . "Modern Castings."

AFS membership is the blending of men, materials and methods within the castings field . . . bound together cooperatively in the common cause of Progress. Every company, every individual, is better equipped to meet the challenge of today's competition with the help that stems from membership in the American Foundrymen's Society.

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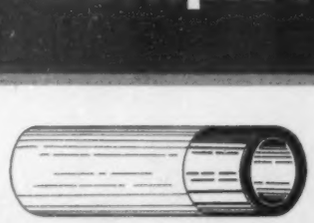

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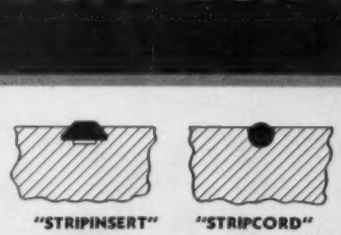

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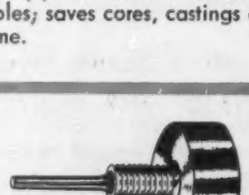
"HOLINER" BUSHINGS
Seals around blow holes at the junction of blow plate and core box.



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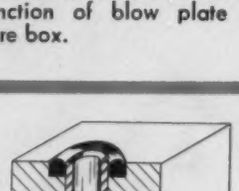

"D RING" COLLARS
Seal around the top of blow tubes, vent rods and guide pins.

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Core room and foundry hand tool. Use to scrape, pry, chisel and pull nails. A new one free if you return one broken.

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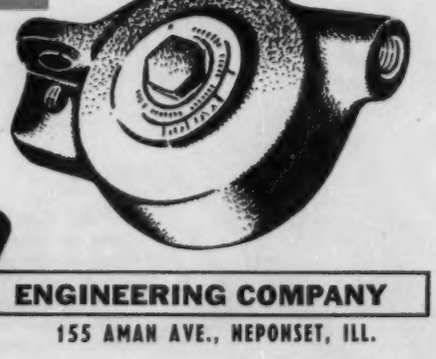

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CIRCLE NO. 254, PAGE 13-14

Lists Critical Jobs For Reserve Status

The Department of Labor has prepared a labor list of critical occupations for screening the Ready Reserve. Each branch of service will screen its own Ready Reserve on a continuing basis in order to provide a Ready Reserve composed of individuals who meet service standards, and who are immediately available for active service.

Various categories will be screened and transferred to the Standby Reserve. These categories include chemists, coremakers, all professional engineers, heat treaters, machinists, industrial maintenance mechanics, key managers, millwrights, model makers, molders, open hearth furnace operators, patternmakers, steel pourers, and tool and die designers.

MIG or Mg: USAF Has the Answers

A study of the constitution and development of magnesium alloys conducted for the Air Force has been released by the U. S. Department of Commerce.

The research is devoted to the constitution of alloys in the solid state in the magnesium corner of the magnesium-lithium-aluminum and magnesium-lithium-zinc alloy systems.

The report, PB 111762, *Magnesium Alloy Research Studies*, Rensselaer Polytechnic Institute for Wright Air Development Center, 138 pages, may be ordered from Office of Technical Services, Department of Commerce, Washington 25. Price $3.50.

Metro Brass Elects

At their March meeting, the Metropolitan Brass Founders Association unanimously voted in the following officers for the coming year:

President, Raymond E. Bietry, B&S Bronze Foundry, Inc.; vice-president, Robert Riescher, Sunnyside Bronze Foundry, Inc.; secretary-treasurer, Irvin Schlansky, Thomas Paulson & Son, Inc. Mr. Bietry and Mr. Riescher are repeaters, while this is the first year for Mr. Schlansky.

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and their application to prac-
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are translated into clear and
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of dilution ventilation and hot
sented. The reader is greatly
d completely worked out illus-
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MC-4/56

foundry facts

Gray Iron / Operating Variables

C. F. WALTON, *Technical Director*
Gray Iron Founders' Society, Inc.

Condensed from the December 1955 issue of *Gray Iron News*

■ The logic of "moderation in all things" applies to most foundry operations. There are usually upper and lower limits of practicality to all the controllable factors. The limitations in the use of some materials may simply be excessive cost. In other cases, technical limitations apply long before cost becomes a factor.

The practical operating limitations to each of the many variables in the casting process must be determined individually for each foundry. The particular conditions present in each foundry influence the importance of the various factors, and personal opinion will decide the particular combination of conditions believed to be the best.

Know Where to Look

With the margin of clear profit becoming narrower, one foundry's excessive margin of safety is another foundry's additional profit. It is important, therefore, to know where to look for the first indications of trouble when limiting conditions are being determined by trial.

For example, consider dry strength of sand. The upper limit of dry strength is economic, since it not only costs money for binders to build up dry strength but increased difficulty at shakeout costs money in time, energy, and material (lumps). The low limit is dependent upon getting the mold closed without drops or crushes. Dry strength to resist metal cutting is generally below that necessary for the mold strength requirements of dry sand molding.

Start with Trial and Error

To determine the minimum desirable dry strength that is practical, it is only necessary to gradually lower the dry strength under controlled conditions until difficulties show up. At this point it may be desirable to change other conditions so as to allow an even lower dry strength. If the first sign of trouble due to inadequate dry strength is associated with a poorly fitting flask, it may be more economical to improve the flask rather than the sand.

When an operating minimum has been established by this method, the desirable range for normal use can easily be set by adding a sufficient value for normal variation. In order to establish the limits of operating variables, it is necessary to know where to look for undesirable effect and to avoid assignment of irrelevant effects.

The following table was assembled for this purpose. An attempt has been made to relate only direct effects. For example, an accumulation of fines in molding sand causes blows. The low permeability is only an indirect indication.

VARIABLE	TOO LARGE, TOO MUCH	TOO LITTLE, TOO SMALL
CUPOLA LINING		
Amount of water in patch mix	Excessive shrinkage results in spalling and possible bridging of cupola	Difficult to apply and make stick
Amount of clay in patch mix	Cracks on drying and burns out more rapidly	Difficult to apply and crumbles when dry
Amount of fine silica in patch mix	Excessive burnout (not as refractory)	Too much clay will be required
Space between brick in lining cupola	Rapid burnout or dropout due to attack along joints	Takes extra time to lay brick
Amount of slurry used in laying brick	Covers up poor job of brick laying	Requires excellent brick laying
Tuyere area	Tendency for air to channel up sides of cupola	Greater blowing power is required
Tuyere top overhang	Reduces melting capacity	Slag and metal drip into tuyeres
Distance from slag hole to tuyeres	Less capacity of metal in well	Slag will get into the tuyeres
Distance from slag hole to tap hole	Excessive well capacity, lower temperature	Insufficient well capacity for good mixing
Front slagging dam height above tap hole	Excessive slag retained in well	Air blows out tap hole
Moisture in sand bottom	Cold first iron, frozen tap hole	Bottom run-out
Slope of bottom toward tap hole	Hard first tap	Much iron in drop
Diameter of tap hole	Slag out tap hole, hard to batt	Slow tap, colder iron because of delay
Length of tap hole	Hard tap, freezes up	Burns out too soon
Slag hole size	Large loss of air	Slag flow too slow
Slag hole length	Freezes off	Burns out
Slag hole toward inside of cupola	Runs too hot and burns out	Runs too cold and freezes off
CUPOLA OPERATION		
Purchased cast scrap to replace pig	Difficult to control analysis, iron too hard	More expensive mixture, iron too soft
Steel addition	Carbon too low	Carbon too high
Sizes of pieces in charge	In efficient melting, charge too open	High blast pressure, high melting loss
Plate scrap	Blocks off gas flow, deflects against lining	———
Amount of coke	Slow melting rate	Cold iron
Size of coke	Excessively high bed, more coke needed	High blast pressure, less efficient, more coke needed

foundry facts

Gray Iron / Operating Variables

VARIABLE	TOO LARGE, TOO MUCH	TOO LITTLE, TOO SMALL
Amount of limestone (acid lining)	Excessive burnout	Viscious slag, bridging of cupola
Total charge weight (hand charge)	Excessive variation in tapped metal analysis and temperature	Increased labor cost
Total charge weight (mechanical charge)	Excessive variation and capacity of equipment	Inability of equipment to keep up with cupola
Air blast rate	Excessive loss of carbon and silicon	Low iron temperature
Melting rate of cupola	Erratic operation	Low iron temperature
MOLDING SAND		
Permeability	Poor finish	Blows or excessive venting necessary
Green strength	Hard to ram, shakeout	Excessive use of gaggers, sand drops
Dry strength	Hard shakeout, lumping of sand	Cuts or washes, mold edges crumble (drops or crushes with dry sand)
Hot strength	Casting cracks, hot tears	Cuts and washes
Flowability	Brittle sand, hard to patch	Hard to ram uniformly
Average grain size of sand	Rough casting finish	Low permeability, less refractory
Member of principal grain sizes	Low flowability and permeability	Brittle sand (low deformation
Clay content (regular test properties OK)	Fins on surface of casting due to shrinkage cracks in sand	Expansion defects (rat tails, buckles, scabs)
Sea coal content	Misruns, blows	Poor finish
Organic cushioning material	Difficult to mold with	Expansion defects, hard shakeout
Water content	Blows	Low strength, drops, crumbled edges
CORE OIL PRACTICE		
Sand grain size	Rough casting finish	High oil consumption
Clay or silt content	High oil consumption	No minimum except when used for hot strength or against sag
Core oil content	Cannot bake out	Weak cores
Cereal content	Doughy	Low green strength
Water content	Sticky sand	Low green strength
Baking temperature	Burnt outside, green inside	Long bake time needed
Bake time	Burnt cores	Green cores

VARIABLE	TOO LARGE, TOO MUCH	TOO LITTLE, TOO SMALL
BLACK CORE SAND		
Clay content	Low flowability, slow bake	Low green strength
Pitch content	Difficult knock-out	Low baked strength
Water content	Difficult to bake	Low green strength
POURING		
Ladle capacity	Wide range in pouring temperature, sloppy pour	High labor cost moving iron, limited casting size
Ladle skimming	Lost time and metal temperature	Dirt in castings
Number of mold clamps or size of weights	Wasted effort	Runouts
Clamp tightness	Distortion	Ineffective
Rate of supplying metal to floors	Poor workmanship, faulty and colder pouring due to delaying molten metal	High labor cost
CLEANING ROOM		
Size of blast abrasive	Rough casting finish	Reduced cleaning rate, more abrasive consumption
Grit of grinding wheels	Rough casting finish	Reduced grinding rate, overheated casting
Hardness of grinding wheel	Reduced grinding rate because of glazing; over-heated casting	Increased wheel consumption
PATTERN RIGGING		
Riser diameter	Lower yield	Does not absorb shrinkage
Riser height	Lower yield	Freezes from top
Distance between two risers	Feed will not reach and will shrink in between	One riser will feed the other —low yield
Length of riser neck	Freezes off too soon	Hot spot in casting is likely to break in
Size of riser neck	Hard to break, grind	Ineffective feeding
Gate area	Too rapid pouring for satisfactory choke	Too slow pouring
Pouring rate	Cuts, slag and dirt, non-directional solidification	Misruns, very directional solidification
Slag trap in gating system	Lower yield	Potential slag in casting
Pouring basin or cup size	Lower yield—difficult handling and removal	Interrupted pouring, metal splashing, slag down sprue
Flask size	Longer molding time	Difficult molding, potential runouts
Flask height	Longer molding time	Misruns, distortion
Play in flask pins	Shifts	Crushes, drops

Protests Scrap Export To Government Committee

■ When the U. S. House of Representatives' Banking and Currency Committee was holding hearings on the scrap situation, one section of the expert testimony was delivered by Donald H. Workman, executive vice-president of the Gray Iron Founders' Society.

Mr. Workman pulled no punches, as these excerpted quotes attest:

On the industry: "Gray iron castings are major components for automobiles and trucks, machine tools and machinery . . . practically all industry depends on gray iron products, just as our industry depends on iron and steel scrap."

On exports of scrap: "Our industry is rightfully concerned about the unleashed export of ferrous scrap for these reasons. Exports are not in the best interests of national security, the record proves . . . Current record high levels of export have naturally brought about a degree of quality deterioration and at least spotty temporary shortages in available supply . . . Reports to us indicate that nearly 65 per cent of exported scrap has been of high quality such as is required by gray iron foundries . . .

"The growing of shortage of high quality scrap or even its availability at highly inflated prices works a serious handicap on the foundry . . . its higher cost hits the small non-integrated operator's pocketbook harder. Foundries are small businesses, and the distance between success and failure is short."

On national security: "No one . . . knows exactly how much of a scrap reservoir we really have. The department of Commerce recognizes this fact, and are contemplating a comprehensive survey . . . the Department (has) examined seven scrap studies, five of which all conclude we will have a short term scrap shortage in 1957-1960."

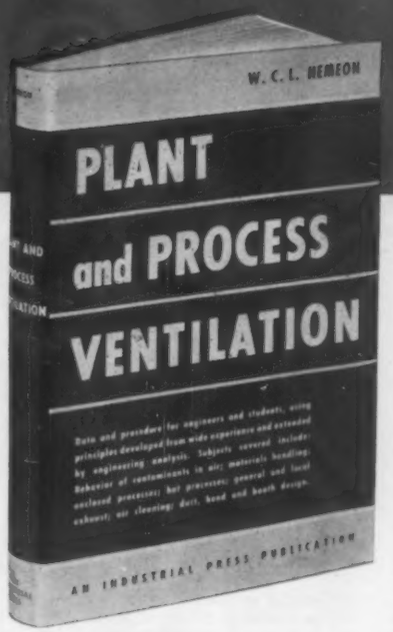
On what to do: "We recommend (suspension) of export of further iron and steel scrap, except for the traditional allowances to Canada and Mexico, until a thorough study of the scrap situation can be made . . . to ascertain how much, if any, scrap should be permitted to be

continued on page 166

CIRCLE NO. 243, PAGE 13-14

4 BASIC BOOKS

To Help You Solve Plant Ventilation Problems



1 PLANT AND PROCESS VENTILATION, by W. C. L. Hemeon, presents for the first time a comprehensive treatment of fundamental principles and their application to practice in the design of ventilating systems for control of industrial air contaminants. Physical laws are translated into clear and logical procedures for calculating required air volumes and velocities for exhaust, ventilation, and material transport. New meaning is given to velocity contours around suction openings. The author's original concepts of dilution ventilation and hot process ventilation are fully presented. The reader is greatly assisted by carefully selected and completely worked out illustrative problems. Theodore Hatch in his review says: "This volume, to an outstanding degree, raises the level of analysis and design from an empirical stage to one based upon sound physical and engineering principles. The book is written for practical design engineers. Use of the design principles . . . will result in better performance . . . fewer system failures, and lowered operating costs." 448 Pages, 172 Illustrations. $9.00. In Canada or overseas, $10.00.

2

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS

How to design, build or buy an exhaust system that will conform to the requirements of law as well as to good industrial hygiene practice. Covers mechanical arrangements and basic design data for a wide variety of industrial situations, such as the removal of dust, fumes, vapors, gases and steam. Provides practical data on exhaust ventilation, design of hoods, piping and structural details, selection of dust separators, centrifugal and axial-flow exhaust fans. 252 Pages, 120 Illustrations. $3.50. In Canada or overseas, $4.25.

3

EXHAUST HOODS

This book, by J. M. DallaValle, is the only book published that gives comprehensive information on the flow of air around and into the openings, hoods or slots in exhaust ventilating systems. Covers all phases of hood, booth and slot design. Shows how to determine the required air volume and velocity for hoods and other types of openings for the control of all kinds of dusts, fumes and gases. Contains a chapter devoted entirely to sample problems and solutions. 130 Pages. 127 Illustrations. $3.50. In Canada or overseas, $4.20.

4

FLOW AND FAN

Gives you the *how* and *why* behind the basic calculations in the design of ventilating systems, and therefore provides the practical information you need to select a fan for a specific duty. If you are in any way concerned with the movement of air through ducts and the selection and control of fans, this will be a first-rate working handbook for you. The author, C. Harold Berry, holds the rank of Professor of Mechanical Engineering at Harvard. 232 Pages. 84 Illustrations. $4.00. In Canada or overseas, $4.70.

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Additional books on ventilation, metalworking and related subjects are described and illustrated in the new 1956 Industrial Press Catalogs. To get your free copies, just check the coupon.

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?

DOES YOUR COMMUNITY CONSIDER YOU A GOOD NEIGHBOR

or...

do you, like so many other Industrialists, close your eyes to the offenses of your own Foundry?

Fig. 15—Schematic diagram of simple spray washer for cupola dust collector and auxiliary equipment.

Fig. 4—Simple spray washer for cupola stack.

AFS

During the past 15 years the control of smoke and air pollution has been a growing municipal problem in cities throughout the United States.

It is to enable foundry management to adopt smoke and air pollution control measures for a specific operation in a given locale, as well as to municipal agencies, that the work of the AFS Safety-Hygiene and Air Pollution Control Program continues.

"Control...

of Emissions from Metal Melting Operations" is a comprehensive study prepared by the AFS Air Pollution Control Committee working on an industry-wide project. Bound in 8½ x 11-inch pamphlet form, the material deals with the general subject of air pollution and its control . . . describing the engineering characteristics of the various types of equipment now in actual service for controlling emissions from metal-melting operations. Typical operating data, obtained from installations of several types of equipment, also are included.

Information...

contained in this pamphlet will provide foundry management with a valuable guide to the steps necessary for control of air pollution . . . in a manner that his plant may continue to operate as a "good neighbor," complying with local air pollution ordinances now in effect or, possibly, forthcoming soon!

Value of text is enhanced and clarified by practical illustrations, tables and an extensive bibliography.

Order copies for each member of your management staff... for the ready, helpful information that this 26 page booklet includes–* $1.50 *to AFS Members;
$2.25 to Non-Members.

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Golf & Wolf Roads, **DES PLAINES, ILLINOIS**

Please send_____copies of **Control of Emissions from Metal Melting Operations.** $_____enclosed.

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☐ Non-Member

Name

Company Title

Address

City State

AMERICAN FOUNDRYMEN'S SOCIETY
GOLF & WOLF ROADS, DES PLAINES, ILLINOIS

10 Big Questions for B&B

■ Brass and bronze foundrymen are expected to fly hammer and tongs into the discussion questions at the brass and bronze round table meeting to be held during the AFS Castings Congress at Atlantic City.

To allow brass and bronze foundrymen to prepare answers to the questions that will be aired at the Friday May 4 meeting, the round table chairman, B. A. Miller of Crown Non-Ferrous Foundry, Inc., has released the questions for advance publication.

The questions are:

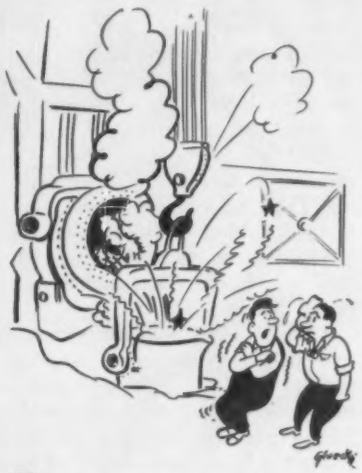
1. Due to the present economic conditions, what are the foundry problems when attempting to down grade the copper base alloys:
   a. Does down grading effect maximum section size for the different alloys?
   b. Can same pattern equipment and gating systems be used?
   C. What metal characteristics are affected by down grading?
   d. What additional controls are necessary when down grading?
2. Have there been any new developments in the furnace equipment for melting the copper base alloys?
   a. Indirect arc.
   b. Induction (low and high frequency).
   c. Gas and oil fired furnace (Crucible and open flamed).
   d. Coke fired furnaces.
3. Is it possible to melt and then hold under a charcoal cover copper base alloys (85-5-5-5 especially), for a relatively long period of time, at temperature and still maintain quality of melt?
4. Since the high strength copper base alloys have shown such a rapid growth in their useage during the past year, what foundry practices are required to maintain high quality in these alloys?
   a. Aluminum bronze
   b. Nickel aluminum bronze
   c. Manganese bronze
   d. Silicon brass
5. What techniques have been developed for repair welding the copper base alloys?
   a. Aluminum bronze
   b. Nickel aluminum bronze
   c. Manganese bronze
   d. Silicon brasses
   e. Red Metals ("G", "M", 85-5-5-5)
6. Are better quality copper base alloy castings being made in the foundry, by the use of–
   (a) The CO_2 process?

continued on page 163

continued from page 162

(b) Shell molding
(c) "D" Process
(d) High pressure molding

7. What percent of combustible materials is allowable in blended sands?
8. What causes the gas holes just beneath the surface of the casting adjacent to the core sections on low zinc alloys; i.e., 80-10-10, 88-10-2-0, 89-11, etc.? What can be done to correct this condition?
9. What have been the practical advancements in the use of the vacuum degassing equipment in the copper base alloy foundries?
10. What can be done to prevent metal penetration into cores?



Somebody leave a door open? I'm cold!

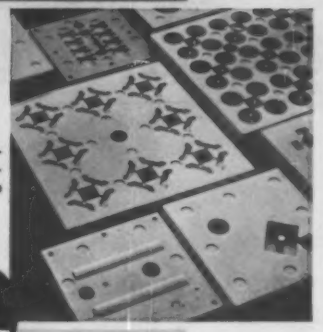
New Steel Spectro Samples

National Bureau of Standards has added six new standard samples of stainless steel, designed for calibrating and checking spectrochemical methods of analysis. NBS standards now provide certified concentration values for determining most of the elements met in stainless steels. The new certifications cover manganese, silicon, copper, nickel, chromium, and molybdenum.

Samples come in two forms: rods 7/32 in. diameter, 4 in. long, and rods ½ in. diameter, 2 in. long. Both serve as electrodes for spark excitation in spectrochemical analysis. They may be obtained for $8 each from the National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C.

CIRCLE NO. 225, PAGE 13-14

STACK POURING of Alnico magnets, 12 to 16 high. 2% of resin produces necessary *high strength*, saves time and space.



BLOWN SHELL CORES. *Non-segregating* qualities lend themselves perfectly to shell and core blowing techniques.

an important message to foundrymen about shell molding and the

PlastiSand® PROCESS

The PlastiSand Process, utilizing liquid-resin coated sand in shell molding, was introduced to foundrymen 4 years ago. Before it was offered to the industry, the process was tested in numerous foundries, large and small, so that every advantage claimed for it could be double checked and proved.

Now, after 4 years, with the PlastiSand Process in use in over three hundred foundries, the Acme Resin Corporation not only repeats these claims, but, from reports from these foundries, has found the advantages to be more positive than when originally offered.

With the increased use of the PlastiSand Process in the United States and its acceptance by foundries in Canada, England, Germany, Austria, France, Italy and Japan, Acme Resin Corporation is increasing its production capacity with new plants in Massachusetts, California and Canada.

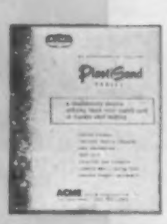
The PlastiSand Process is adaptable to dump-box, roll-over and blowing of either shells or cores.

ACME RESIN

CHECKPOINTS FOR FOUNDRYMEN...

- ✓ **ECONOMY** ... Foundries using the PlastiSand Process report superior molds with as little as one-half the resin content formerly necessary with dry resin.
- ✓ **SHORTER DWELL, FASTER CURE** ... Less time on the pattern and a faster baking cycle means more production.
- ✓ **NON-SEGREGATING** ... Each grain of sand is completely and uniformly coated with liquid phenolic resin in the PlastiSand Process.
- ✓ **EXCELLENT HOT STRENGTH** ... Equal or superior to that obtained by the use of dry-resin mixes.
- ✓ **SUPERIOR TENSILE STRENGTH** ... PlastiSand molds have much greater cold strength, a factor gaining importance as new stack pouring techniques are developed.
- ✓ **DUST FREE** ... An invaluable safety and health factor. The absence of dust means healthier working conditions, no irritating dust fumes, no danger of dust explosion.
- ✓ **NON-CLUMPING** ... Sand, treated with the PlastiSand Process is always free pouring—regardless of temperatures.
- ✓ **GREATER PRODUCT UNIFORMITY** ... Resin-coated sand prepared by the PlastiSand Process yields almost identical molds, batch after batch.

This informative booklet may be obtained by writing to Acme Resin



Resin formulation and the coating process covered by Patents 2,706,163 and 2,706,188

ACME RESIN CORPORATION
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SEE OUR EXHIBIT AT ATLANTIC CITY—BOOTH 1306

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Why not talk this over with one of our metallurgists with a view to taking advantage of the superior quality of Semet-Solvay Foundry Coke in reducing your melting costs.

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For Better Melting

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Since 1903

CIRCLE NO. 257, PAGE 13-14

CIRCLE NO. 258, PAGE 13-14

Gray Iron Redesign May Win You $500

■ The human mind being lazy by nature, its best work is usually done under fire. The really good ideas are usually thought up under the pressure of competition, such as when a foundry has to dig hard to offer improvements to existing products or parts in order to replace competitive materials.

Somebody had such an idea last year. Somebody dug in to get an order. And somebody is going to submit it in the 1956 Gray Iron Redesign Contest and walk off $500 richer.

Here's how simple it is to enter: select the best design, and the casting from this design, which has been converted from a competitive material to gray iron. Tell what it is and why you redesigned this product or part as a gray iron casting. Tell which of gray iron's many features added to its efficiency or reduced costs to make the redesign practicable. That's all there is to it!

The 1955 winner, for example, was an automatic valve. Redesign in gray iron saved 70 per cent in production costs and eliminated a service problem. In 1954, the $500 winner was a screw nut that had originally been hogged out of bar stock. As a cored gray iron casting, it reduced costs by 83 per cent.

Simple Contest Rules

There are only four rules to this contest.

■ 1. Submit an 8 x 10 in. glossy photograph of the gray iron casting you wish to enter. If possible, also submit a photo of the original design before it was converted.

■ 2. Write all the facts leading up to your redesign, such as why you thought of gray iron, how much was saved in labor and/or material costs, how much efficiency was gained. Give the facts that will tell us how the gray iron casting is working out better than the original design.

■ 3. Mail the photos and all facts about your redesign to: Redesign Contest, Gray Iron Founders' Society, Inc., National City-East 6th Bldg., Cleveland 14, Ohio. Your

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entry must be postmarked not later than July 1, 1956.

■ 4. This contest is open to all persons engaged in the entire metalworking industry. Entries may be made jointly by two or more individuals. Awards will be made at the 28th annual meeting of the society in Hot Springs, Va., on November 2.

The society sponsors this contest every year to uncover new ideas for gray iron castings which have been produced in this country's gray iron foundries. The best casting designs are given adequate publicity. Then everyone interested in improving his products learns of gray iron advantages and can perhaps raise his own product standards by converting.

So there it is—$500 (or $250 for second prize, $100 for third) just for the taking. Get busy on your entry, and good luck!

Palmer
Amsco
St. Louis

The doc said I should take off on vacation and lay around in the sand.

Continuing Bibliography on Air Pollution

The Library of Congress has agreed to prepare a continuing, annotated bibliography on air pollution for the Public Health Service. The bibliography will include references to the physical, biological, engineering, legal - administrative, and economic aspects.

CEDAR HEIGHTS
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Quality Since 1924
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Let us furnish a free sample for your examination
FROM THE WORLD'S FINEST CLAY DEPOSITS
High refractory value, high green strength, high dry strength at high temperatures! For the bonding agent with greater durability and economy ask for, and insist on getting, Cedar Heights "Bond." Produced in No. 8, 12, 16, 20, 30, and 50 meshes.
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Makes a smooth, working sand and saves you money, too.
Can be shipped anywhere, anytime. See your distributor today.
CEDAR HEIGHTS CLAY COMPANY
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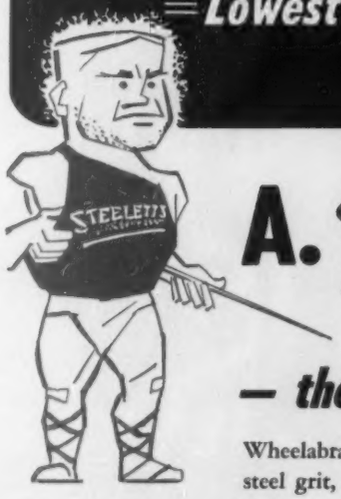
CIRCLE NO. 259, PAGE 13-14

Q. What is the only Grit combining

LONG LIFE
+ HIGH HARDNESS
+ SUPER ETCH ACTION

= Lowest Cost Etched Finish

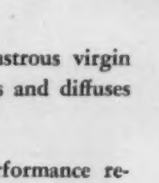


A. STEELETTS® — the NEW Steel Grit

Wheelabrator Steeletts, the new high carbon steel grit, are the answer to savings in abrasive costs because they clean and etch faster, last longer and etch more deeply and uniformly. They are also the answer to equipment maintenance because unlike ordinary chilled iron grit, Steeletts resist breakdown and reduce formation of sharp edges that cause excessive wear.

Steeletts open the surfaces of the work, exposing lustrous virgin metal. The etched surface created by Steeletts reflects and diffuses light — sun bright cleanliness is uniformly obtained.

Only Steeletts have the toughness, hardness and performance required for economical blast cleaning operations. Try Steeletts and see for yourself how they will provide the lowest cost etched finish.



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WORLD'S LARGEST MANUFACTURER OF STEEL ABRASIVES

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CIRCLE NO. 260, PAGE 13-14

continued from page 161

exported in keeping with the interests of national defense, and a healthy U. S. economy.

We further recommend that the Export Controls Act be amended to include new criteria which would specifically set the amounts of strategic reserves of critical materials to be kept in this country."

Preheated Ladles Cut Loss

Heat lost by molten metal while standing in a ladle has been studied by Dr. Victor Paschkis, Columbia University, in the first phase of a new research project sponsored by the Heat Transfer Committee of the American Foundrymen's Society.

Because the committee believes that the ladle is the greatest single contributing factor in temperature loss, it is sponsoring this project which concerns loss of heat as affected by ladle capacity, lining, thickness, holding time, and drying and preheating of the ladle.

The committee has drawn the following tentative conclusions from the study:

- Preheating of ladles is essential.
- Proper preheating to a given temperature can be considered complete only if the lining is fully soaked with heat.
- A lid is desirable because much of the heat loss can be traced to the top of the ladle.
- Thickness of lining increases in importance as preheating temperature is increased. Without preheat, or with low preheat, the thickness of lining is not significant.

GIFS North of the Border

A Canadian Management Executive and Cost Group of the Gray Iron Founders' Society has been organized in Hamilton, Ont. The organizational meeting was attended by representatives of 26 firms, but the nucleus is eight gray iron foundries that have been meeting with the GIFS Buffalo Cost Group.

Formation of the Canadian Group brings the number of local GIFS Management and Cost Groups to 20.

Get results with MODERN CASTINGS ads.

Q. What steel shot provides

FASTEST CLEANING
+ LOWEST SHOT CONSUMPTION
+ LOWEST EQUIPMENT MAINTENANCE

= Lowest Cost Cleaning

A. WHEELABRATOR®

STEEL SHOT

Wheelabrator Steel Shot is the only shot that gives you all the qualities vital to lowest COST cleaning and peening. Its high hardness gives super cleaning speed. Its toughness gives extra long life for minimum shot consumption and low maintenance costs. Wheelabrator Steel Shot has so proved itself that it now outsells all other steel abrasives combined. It outsells because it outperforms. Try it today. It's the low-cost answer to your cleaning problems. Write today for your copy of Catalog 89-C.

Now available in new S.A.E. size S-280 shot

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CORPORATION

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CIRCLE NO. 260, PAGE 13-14

Henry Hanley Dead

■ Henry B. Hanley, 69, formerly foundry manager, American Laundry Machinery Co., Rochester, N. Y., with which he was associated for 25 years, died March 20 in Rochester after an illness of some eight weeks. He had been retired since the beginning of 1955.

H. B. Hanley

Born in North Attleboro, Mass., Mr. Hanley attended the public schools of Providence, R. I. Later, he furthered his education with special work at Brown University and Massachusetts Institute of Technology.

Before joining American Laundry Machinery Co., he was chief metallurgical chemist with Saunders and Franklin, Providence, and held positions as metallurgist and consultant for several other companies on the East Coast.

Mr. Hanley was a national director of the American Foundrymen's Society from 1937 to 1940 and was the founder and first president of the Rochester Chapter of AFS. He prepared the first American Exchange Paper to the International Foundry Congress in Paris in 1922.

Mr. Hanley was a student of Dr. Richard Moldenke and a pioneer in sand research and technology in this country. He was the creator of the hanley patent on production of synthetic molding sands, and traveled extensively speaking and demonstrating foundry sand testing and control methods.

During World War I he served as a consulting metallurgist to four war plants.

COMPANY or SUSTAINING MEMBERSHIP

PROTECTED BY MANAGEMENT

. . . Underwrites Future Progress

THE TRAINING AND DEVELOPMENT of foundry employees in firms holding Company or Sustaining Membership in the American Foundrymen's Society is underwritten by an investment on the part of Management . . . an investment that extends to all Supervisory personnel the full advantages of Personal Membership at annual dues of only $10:

- CASTINGS EXHIBITS
- CHAPTER CONTACTS
- COMMITTEE ACTIVITIES
- EDUCATIONAL ACTIVITIES
- INDUSTRY-WIDE FRIENDSHIPS
- "MODERN CASTINGS" MAGAZINE
- NATIONAL CONVENTIONS
- REGIONAL FOUNDRY CONFERENCES
- RESEARCH PROJECTS
- SAFETY, HYGIENE AND AIR-POLLUTION CONTROL PROGRAMS
- TECHNICAL PUBLICATIONS

Today, the man who succeeds is the man equipped for his job, who recognizes the value of team work. He knows that personal advancement for himself . . . and more efficient operation for his company . . . hinge on keeping abreast with his industry's developments.

Job Performance is rated in industry today with the same precision as product quality and production efficiency. It is coupled with dependability, technical knowledge and engineering application.

The Foundry Manager who insures these advantages for his employees, through Company or Sustaining Membership in the American Foundrymen's Society, knows that an Investment in Human Progress is the soundest way to guarantee the future of his men . . . his plant . . . his industry.

Annual AFS *Dues*

COMPANY MEMBERSHIP $100

SUSTAINING MEMBERSHIP $300 min.

American Foundrymen's Society

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Distributing Line Of Cool Air From Receiver Tank
Vapor Free Air Near Point Of Use
Take Off From Top Of Pipe
Replaceable Desiccant

MURPHY TRIUMPH AA SEPARATOR-FILTER
Sizes: ¼, ⅜, ½, ¾; Weight 30 lbs; Pressures: 0 to 125 psi; Price: $71.00 ea; Desiccant refills $1.00 ea.

After precooling and separating compressed air, this small unit, placed close to the point of use will finish the job of removing last traces of impurities. Where very particular work demands dry air completely free from any trace of oil or vapors Murphy Triumph AA is the answer.

AFTERCOOLERS FOR 10 CFM TO 10,000 CFM—SEPARATORS—TRAPS

JAS. A. MURPHY & CO. INC.

East High Street, Hamilton, Ohio

CIRCLE NO. 261, PAGE 13-14

PQ Silicate of Soda Service

Over forty silicates of soda, (liquid and dry), are available to meet industry's needs.

CONVENIENT PLANTS:

Deliveries from nine plants located in Anderson, Indiana; Baltimore, Maryland; Buffalo, New York; Chester, Pennsylvania; Jeffersonville, Indiana; Kansas City, Kansas; Rahway, New Jersey; St. Louis, Missouri; Utica, Illinois.

LONG EXPERIENCE

PQ silicates have been made since 1860. Helpful data on silicates and their uses available in PQ bulletins. Request a copy of PQ Silicates in the Metal Industry.

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PQ SOLUBLE SILICATES
METSO DETERGENTS

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CIRCLE NO. 262, PAGE 13-14

afs chapter meetings

MAY

1 . . Rochester . . Hotel Seneca, Rochester, N. Y. Election of Officers.

10 . . Saginaw Valley . . Fischer's Hotel, Frankenmuth, Mich. Harry Gravlin, Claude B. Schneible Co., *"New Foundry Developments."*

11 . . Central New York . . Onondaga Hotel, Syracuse, N. Y. Vertical and horizontal gating films.

12 . . Michiana . . Elkhart Hotel, Elkhart, Ind. Ladies Night.

14 . . Corn Belt . . Fireside Restaurant, Omaha, Neb. Harold F. Randolf, Mexico Refractories Co., *"History & Recent Developments of the Refractory Industry."*

14 . . Chicago . . Chicago Bar Association. Film: *"Convention Highlights."*

15 . . Twin City . . Covered Wagon, Minneapolis. Ray Carlson, Northern Ordnance, Inc., *"Supervisory Responsibilities."*

16 . . Oregon . . Heathman Hotel, Portland. Casting Defects panel and Election of Officers.

17 . . St. Louis District . . York Hotel. Frank Steinbach, editor, *Foundry, "Can We Sell More Castings?"*

17 . . Northeastern Ohio . . Tudor Arms Hotel, Cleveland. Old Timers and Past Presidents Night.

18 . . Central Michigan . . Windsor, Ont. Plant visitation at the Ford foundry.

18 . . Texas . . Commodore Perry Hotel, Austin. Ladies Night. Dr. Marvin S. Vance, minister of the First Methodist Church, will give the After Dinner speech. The next morning there will be a business meeting breakfast followed by a conducted tour of the State Capitol & Texas University.

21 . . Central Indiana . . Athenaeum Turners, Indianapolis. Clyde A. Sanders, American Colloid Co., *"Sand."*

21 . . Quad City . . Hotel Fort Armstrong, Rock Island, Ill. Clyde A. Sanders, American Colloid Co., *"Sand."*

22 . . Connecticut . . Waverly Inn, Cheshire. Round-table discussions.

25 . . Chesapeake . . Engineers Club of Baltimore. Know Your Local Industries

UNIVERSAL REFRACTORY FOUNDRY SUPPLIES

• UNIVERSAL refractory strainer cores, pouring pipes, and breaker cores are custom-made.

Write today, giving specifications, for quotation on Universal refractory foundry items.

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1505 EAST FIRST STREET — SANDUSKY, OHIO
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CIRCLE NO. 263, PAGE 13-14

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IRVINGTON, NEW JERSEY

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- SEE SHELLS BEING MADE ON SHELL-O-MATIC MACHINE
- MACHINE SELF CONTAINED CAN BE PUT TO WORK UPON DELIVERY
- CAN BE PITTED OR USED WITH PLATFORM
- BUILT IN HEATERS IN THE PATTERN BOX AND NOT IN THE PATTERN PLATE
- ELIMINATION OF EJECTION PIN SPRINGS
- OVEN CAN BE LOCKED IN POSITION FOR CONDITIONING NEW PATTERNS

Machine Completely Automatic . . .

26 Avenue L, Newark, N. J.
146 Coit St., Irvington, N. J.

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The standard of quality

SCIENTIFIC MATCH PLATES
Pressure Cast

Cordial greetings to you—foundrymen and pattern makers. We hope you enjoy the convention and we are looking forward to seeing you at our booth—#311. It will be a pleasure to renew old friendships and make new acquaintances. Bring your friends.

The SCIENTIFIC CAST PRODUCTS Corp.
1390 East 40th St., Cleveland 3, Ohio
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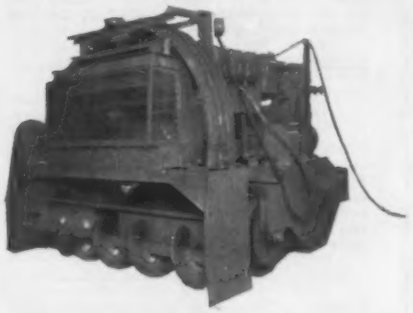

Model B34 Ringlift

Ringlift foundry sand conditioners mix, add water, remove all sand from floor, screen, magnetically separate, aerate and discharge molding sand at rates to one ton per minute. Will cool hottest sands. 36" wide screen-fed magnetic separator assures practically perfect shot iron removal.

Cuts swath to 104" wide, straddles windrows 24" high x 70" wide, but can handle much larger windrows or piles where it is unnecessary to straddle them. Turns in 63" radius, needs only 76" headroom. Most economical machine of this type to buy, to operate, to maintain.

For complete description & specifications write to

STATES ENGINEERING CORPORATION
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CIRCLE NO. 266, PAGE 13-14

Night. Speakers from several local industries.

25 . . Tennessee . . Patten Hotel, Chattanooga. Suppliers Night and Stump the Experts.

25 . . British Columbia . . Pacific Athletic Club, Vancouver. Election of Officers & Guest Speaker.

JUNE

28-29 . . 13th Annual Chapter Officers Conference of the American Foundrymen's Society. LaSalle Hotel, Chicago.

Offer Short Course at MIT

The metallurgy of iron and steel will be taught in a short session, June 18-29, at Massachusetts Institute of Technology, Cambridge, Mass.

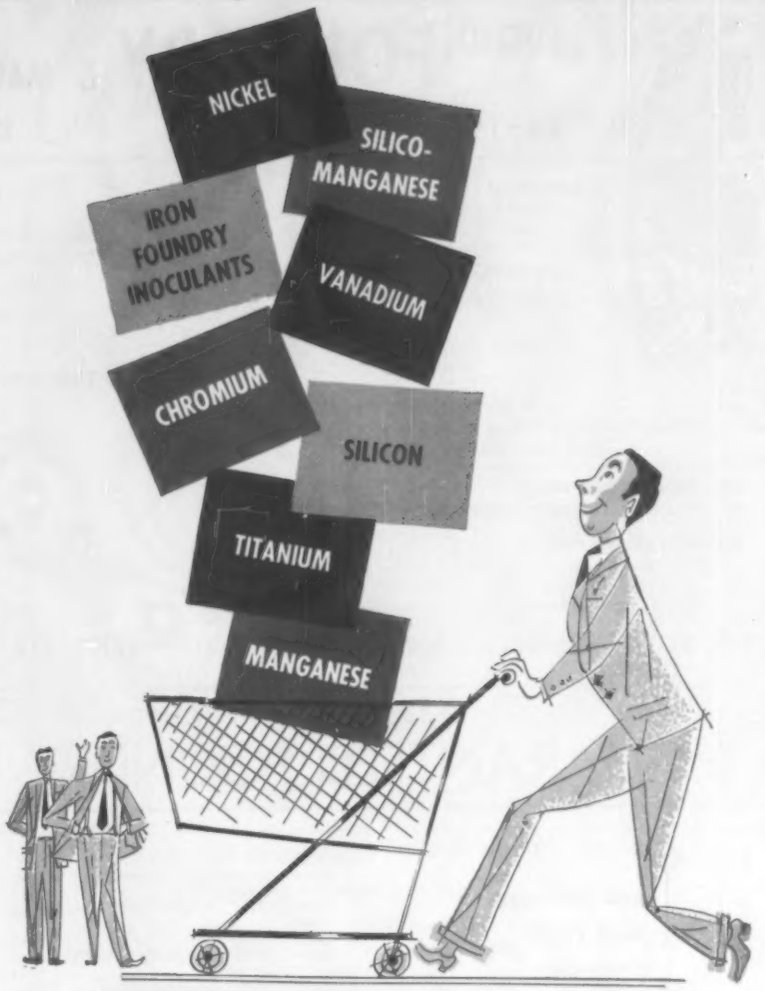
This special summer program will review the basic concepts of thermodynamics and physical chemistry which have direct application. Laboratory studies of reactions in iron and steelmaking will be described and the application of the results discussed.

Information regarding admission to the program may be obtained from Dr. John Chipman, head of the MIT Metallurgy department.

New Nickel Film Available

For 45 minutes of instructive strictly non-commercial entertainment, International Nickel Co. has released a new sound-color film, "*Mining for Nickel.*" The film gives a clear picture of the underground workings of a great mining operation, from original development of a mine to the six methods of extracting ore. Sequences of animation demonstrate the fundamentals of mining engineering.

Explosion shots, one of which moves 500,000 tons of ore, and an unusual shaft-sinking operation add dramatic action. Prints are available free of charge for technical society, regional society, and company meetings. Bookings can be obtained through Rothacker, Inc., 729 Seventh Ave., New York, or International Nickel Co., Inc., 76 Wall Street, New York 5, N. Y.



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Get your handfuls to carload requirements of these, the principal foundry alloys of International Nickel Co. and Vanadium Corporation of America. Fifty-eight alloys are "off-the-shelf" items from your nearest Whitehead warehouse. Each of these seven warehouses is well-stocked for prompt delivery with all standard sizes and forms. A call for quotation will convince you our prices are right, too. Take advantage of this easy way to order these quality foundry products.

Take advantage, too, of our technical service department. Our foundry engineers will be happy to answer any questions you may have, or otherwise work with you in anyway they can.

For higher quality castings, use higher quality alloying materials. And get them fast—Call Whitehead.

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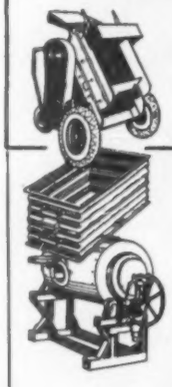

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BELTING:
Belting—286′—36″ x 8 ply Imperial Insulated Sahara to 450° F—10.00 per ft. Never used.

CONVEYORS:
Steel Apron—1 Midwest 36″ x 120′
1 Palmer-Bee 30″ x 19′
1 Palmer-Bee 21″ x 5′6″
Belt—Flat 20″ 24″ 30″ 36″ Troughing 2—24″ x 22′, 1—24″ x 100′
Bucket—2—40′, 3—50′, 8″ x 16″ buckets
Mold—1—Webb 356′ lg., 109 cars 32″ x 39″
1—Link-Belt 200′ lg. 35 cars 38″ x 72″

AIR COMPRESSOR:
1—I-R two stage 800 CFM 150 HP 3/60/220

OVERHEAD CRANES:
1—3 ton Bedford—40′ span, 120′ runway
1—3 ton Shepard—Monorail 25 HP, 550 DC
1—Chisholm Moore Cupola Charing with 200′ rail 550v 3/60

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In Belleville, Ohio, 10 miles south of Mansfield a complete Gray Iron Foundry with No. 7 Whiting cupola, 18,000 sq. ft., with railroad siding.

TUMBLING MILL:
60″ x 72″ Ransohoff tumbling type wet cleaning mill, Serial No. 6318, drive 15 HP, bucket loader 5 HP 3/60/220

MAGNESIUM CLEANING CABINETS:
7—Whirlpool Duplex, 800 CFM, 100″ wide x 65″ deep x 90″ high. Buffalo exhausters —7½ HP., 220/440

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classified advertising

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Help Wanted,
Personals,
Engineering Service, etc.,

set solid . . 20c per word, 30 words ($6.00) minimum, prepaid.

Positions Wanted

. . 10c per word, 30 words ($3.00) minimum, prepaid. Box number, care of **Modern Castings,** counts as 10 additional words.

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HELP WANTED

MELTING METALLURGIST — Tool Steels — Stainless Steels — Superalloys. Staff level for manufacturing control, research and development on melting practice — induction and arc furnaces; specific experience in these alloys required. Some consultation with customers. New operation in old established company. Salary open. Location — Industrial Great Lakes. **Reply Box C132, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOREMAN capable of supervising Pattern Shop restricted to pattern repairs and gating. Also Die Shop production and repair of Straightening Dies for Hydraulic Presses in Malleable operations. Personnel composed of five Pattern Makers and two Die Shop employees. Must also be capable of pattern design and lay-out for new production. Salary open. **Box C131, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

LARGE EXPANDING INDUSTRIAL CONCERN located in Southwest area needs Cupola Supervisor. Must have good metallurgical and foundry experience background. This job offers excellent opportunities for applicant selected. Submit complete resume of work history, personal data, and salary expectations in the first letter. **Box C129, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

SALES REPRESENTATIVE

Midwest Foundry Sand Company offers excellent opportunity for aggressive young man—age limit 40 years—to travel Midwest territory selling foundry sand. Must be experienced in all phases of molding and foundry operation. Salary and commission. Send detailed resume giving experience, training, education and salary requirements in first letter. Replies confidential. **Reply Box C128, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

CLEANING ROOM FOREMAN: Most modern and progressive steel foundry in the middle west. Advise full particulars. **Swedish Crucible Steel Co., 8561 Butler Avenue, Detroit 11, Michigan.**

SALES ENGINEER Well established southeast Foundry offers excellent opportunity to aggressive Sales Engineer in foundry and structural steel. Send full qualifications in first letter. **Box B C 126, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

SALES MANAGER

Familiar with stainless steel and high temperature alloys. Technical background preferred. Location western Michigan. **GEORGE & DIX, Mgt. Consultants, Federal Square Bldg., Grand Rapids, Michigan.**

WANTED: ALUMINUM FOUNDRY SUPERINTENDENT, age 25 to 40, prefer Permanent Mold experience, salary to $7,000. Desire Mechanical Engineer. **Box C127, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY ENGINEER must be qualified to assist and eventually replace present foundry superintendent also skilled or semi-skilled METAL PATTERN WORKERS ENAMELLERS for highly modernized and rapidly expanding foundry of cast iron plumbing fixtures. All applicants must be willing to relocate near MONTREAL, Quebec, Canada. Start Immediately. Good opportunity, steady work, hospitalization plan, benefits, etc. Applications with references and resume. **Box C136, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY METALLURGIST Development and service work involving moderate travel for large corporation producing wide variety of melting materials. Must have sound metallurgical education and wide knowledge of iron and steel foundry technology. Location, middle west. **Box C135, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY SUPERINTENDENT—Excellent opportunity in medium-sized iron, brass and aluminum foundry located in the Southeast. Require superintendent with thorough knowledge of machine and floor molding, gating, sand control, both jobbing and production work. Applicant must know all phases of foundry work and be capable of producing pressure-tight and porous-free castings economically. Send full resume, picture, age and salary expected. **Address Box C134, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

POSITIONS WANTED

METALLURGICAL ENGINEER desires a top position in small or medium size progressive company where experience and administrative ability may be used to best advantage. 14 years diversified experience in research, development and production, ferrous and non-ferrous. Experience includes foundry operations, mill fabrication, equipment design, melting and fabrication of reactive metals, vacuum metallurgy, and others. Salary required $12,000. Age 36. Family. **Box C133, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

PLANT SUPERINTENDENT Metallurgical Graduate, Plant Superintendent of Modern Shell Moulding Foundry for past two years, Foundry Supt. of Mechanized Meehanite Foundry for previous two years, seeks similar position. Familiar with the founding of H.D. and Ductile Irons, the Bronzes and Aluminum. **Box C130, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

EQUIPMENT WANTED

WANTED TO BUY Gravimetric Carbon Determinator — Complete or Part. Anayltical and sand lab balances. Metallurgical microscope. Rockwell Hardness Tester. Laboratory Muller. Millivoltmeter. Send full information to: **AIRLOY, INC., ENNIS, TEXAS.**

BEARDSLEY-PIPER MIXER—Size No. 30. Speed Muller. In reply state price, condition and location. **Box C119, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

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Foundry Sand Engineer.
Consulting . . . Testing.
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Res. Phone Vermont 5-8724

SESSIONS ENGINEERING CO.

Consulting Foundry Engineers
Modernization, Processing Layouts
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One North La Salle St., Chicago 2, Ill.

FOR SALE

FURNACES FOR SALE
10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.
BAER STEEL PRODUCTS, INC.
Box 1428
Boise, Idaho

ONE—Shot Blast 36" Cleaning Barrel Machine with Dust Collector—like new . . . $1500.00. Link Belt Company V Flexmont Oscillating Conveyor 50' x 12" . . . $450.00. Two—Tabor Roll Overs 14 x 20 and 36 x 20 . . . $75.00 each. 120 ft Double Track Westover Conveyor 24" high 45 metal pallets 18 x 72—3 bar, all as new, 65% of new price. One 4000 Gal. Oil Tank 5/16 thick, excellent condition $300.00. Three—Whiting Pourites Ladles 250# with modern handles $100.00 each. One Two Ton Rotary Oil Furnace for iron and steel, 75 minutes per ton guaranteed . . . $5,000.00. 16 ft Handy Handler belt conveyor with motor . . . $135.00. **Box C137, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

BUSINESS OPPORTUNITY

Important British manufacturer of foundry supplies, leader in development of binders for the CO_2 Process, seeks reliable concern in the USA interested in acquiring an exclusive manufacturing and selling license for its binders. **Write to R. K. Price Associates, Inc., 624 Madison Avenue, New York, N.Y.** briefly stating manufacturing facilities and selling organization.

ENGINEERING EDITOR

MODERN CASTINGS

has immediate, permanent opening for engineering editor
Familiarity with metal castings and engineering essential
Foundry engineering experience desirable
Must be able to write rapidly, clearly, accurately
Job includes orginal plant writeups, rewrite, editing, some travel
State experience, education, age, salary requirements
Enclose samples of writing

MODERN CASTINGS, AFS Technical Center
Golf & Wolf Roads, Des Plaines, Ill.

Control Foundry Chilling with

CHILL KOOLHEAD NAILS

CHILL NAILS and SPIDERS

Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum, Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications.

Write for detailed descriptions and prices.

STANDARD HORSE NAIL CORP.
Since 1872 NEW BRIGHTON, PA.

Other Products
PINS Stanho KEYS
SPECIAL PARTS

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During the American Foundrymen's Society
Castings Congress and Exhibit

THE BRUSH BERYLLIUM CO.

is exhibiting the largest continuous-cast Beryllium Copper Rolling Billet ever produced—weighing approximately 1300 pounds.

We cordially invite you to visit our booth #301.

THE BRUSH BERYLLIUM CO.
4301 Perkins Ave. – Cleveland, Ohio.

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EMPIRE
"THAT GOOD"
FOUNDRY COKE
DEBARDELEBEN COAL CORPORATION
2201 First Ave., North Birmingham 3, Ala.
Phone ALpine 1-9135

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CUT CORE ROOM COSTS with HY-TEN Core Oils

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service...

WRITE E. F. HOUGHTON & CO.
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PHILADELPHIA 33, PA.

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It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 13-14. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

obituaries

Martin J. Lefler, 59, plant manager, Oliver Corp., South Bend, Ind., passed away April 6 (see page 146).

Henry B. Hanley, 69, recently retired foundry manager, American Laundry Machinery Co., Rochester, N. Y., passed away March 20 (see page 167).

Keith Williams, 66, general manager, Buffalo Plant, Pratt & Letchworth Div., Dayton Malleable Iron Co., and vice-president, Dayton Malleable Iron Co., passed away February 15. He

Keith Williams

was a member of the Western New York Chapter of the American Foundrymen's Society and a former director and treasurer of the Steel Founders' Society of America.

John Cameron, 86, former managing director of Cameron & Roberton Ltd., near Glasgow, Scotland, passed away recently. He managed this company which his father helped found in 1869 until the time of his retirement in 1945. The company is now associated with Federated Foundries, Ltd.

Mr. Cameron served as president of the Institute of British Foundrymen in 1925 and was awarded the Oliver Stubbs Medal of the institute in 1931 for outstanding service.

Drew F. Farr, secretary and office manager, E. J. Scudder Foundry & Machine Co., Trenton, N. J., died on January 9.

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NEW... FOR YOU FROM STEVENS

THESE NEW PRODUCTS WILL IMPROVE YOUR FOUNDRY OPERATIONS

IGNICOAT—FAST DRYING MOLD SPRAY

Eliminates lengthy drying of mold coating by torch or oven. Can be sprayed, brushed or swabbed. Ignicoat mixes rapidly with isopropyl alcohol and contains the proper percentage of binder to insure good film adherence to the sand. When ignited, burns with a gentle flame. Molds may be closed and poured as soon as burning stops.

RED-SKIN CORE COATING

Does not run, streak, tear-drop or pile up at the edge of the core. It is a refractory type core coating that insures clean peel of sand from castings. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous metals. Red-Skin has deep penetration and seals several layers of sand, to prevent metal penetration.

GRAPH-KOTE COATING

Graph-Kote is a "short" coating which means a sharp dip line. It coats only where the coating is needed, assuring accurate fitting of core prints and assemblies. Cores can be dipped faster and its even uniform coating gives ample coverage to produce clean castings. In its original paste form, Graph-Kote can be stored indefinitely in the original Stevens polyethylene lined drums.

NEW IMPROVED FASTICK LIQUID CORE PASTE

Has very rapid air or oven drying qualities. Gives excellent results with resin-bonded cores and shell molds. Permits elimination of clamps on shell mold halves. Strength is not reduced at high temperatures. As a time saver, Fastick will reduce your costs as it is mixed and ready to use when received.

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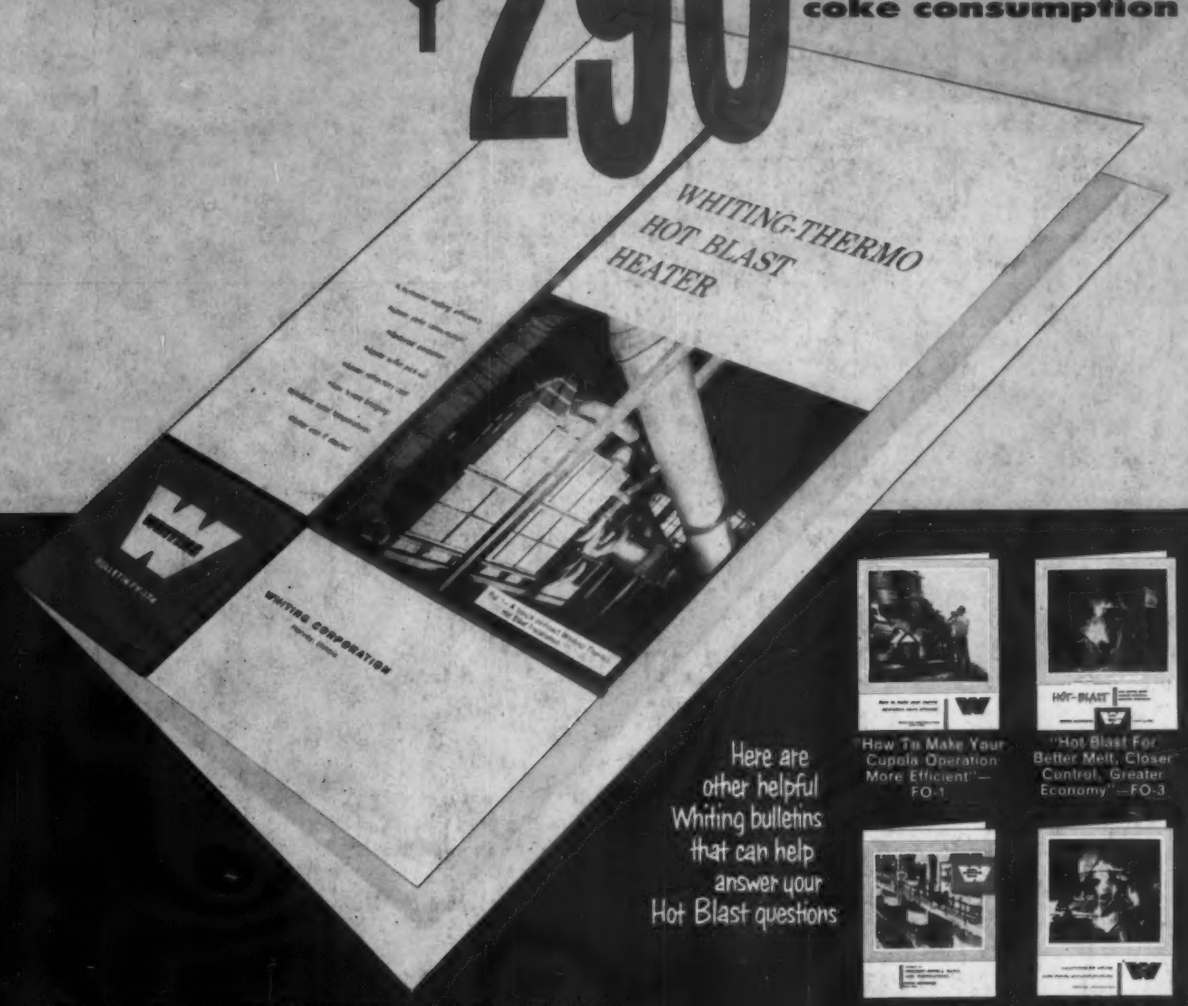
FREDERIC B. STEVENS
INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 16, MICHIGAN

VISIT BOOTH 216
1956 Castings Congress and Show
Atlantic City Convention Hall
May 3—9

WRITE TODAY FOR TRIAL ORDER OR AN "IN-PLANT" TEST ON ANY OF THESE NEW STEVENS PRODUCTS

read how you can save up to $290 a day in cupola coke consumption



Here are other helpful Whiting bulletins that can help answer your Hot Blast questions

"How To Make Your Cupola Operation More Efficient"—FO-1

"Hot Blast For Better Melt, Closer Control, Greater Economy"—FO-3

"Review Of Foundry Cupola Gas and Temperatures"—FO-9

"Suggestions For Solving Some Cupola Operation Problems"—Bulletin FO-8

Based on an average 400-ton per day cupola melt, pre-heated blast can raise metal temperatures and at the same time create a 28% coke savings! This is possible at an expenditure of only $45 in gas fuel, giving an actual fuel savings of $290 per average work day and many thousands of dollars per production year.

Now any cupola can be converted at low cost with a Whiting-Thermo Hot Blast Heater to provide the highest efficiency in hot blast. Whiting has prepared a new booklet on this cost cutting hot blast heater which tells about all hot blast advantages. It also fully describes burners, combustion chambers, heat exchangers, air booster fans, control panel and controls, auxiliaries, and air by-pass as well as general design features. Write for this free booklet today! Ask for Bulletin FY-174. Ask for the other bulletins shown also!

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